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Internal Audit Function Quality and Corporate Governance: The Case of Greece

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Internal audit is fundamental in maintaining transparency in the dissemination of information about a company's financial position and performance. In this respect, the quality of internal audit is essential for effective corporate governance. We construct a composite measure of the quality of the internal audit function and explore its association with "good" corporate governance. Employing data from 45 listed companies in the Athens Stock Exchange, we discover that "good" corporate governance affects internal audit function quality, since the internal audit function is better in companies that comply with certain corporate governance guidelines. On the other hand, we find limited evidence on the effect of internal audit function quality on effective corporate governance. We also discover that internal audit's active role in corporate governance is shaped by company-wide characteristics such as size, internationalization and CEO duality.

Keywords: internal audit; internal audit function; quality; corporate governance; Athens Stock Exchange; survey

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I. Introduction

Major accounting scandals in early 2000's spawned increased requirements on accountability and transparency. They also triggered increased interest in accounting information and corporate governance (*CG*). These scandals, combined with major changes in the shareholder structure of listed companies, led to a richer set of guidelines and regulations on *CG*. According to *CG* guidelines, internal audit (*IA*) is an essential mechanism of control, along with external audit. The increased interest in *IA* transformed its role, which expanded beyond the traditional framework of compliance audits and was characterized as a fundamental function for *CG* effectiveness (Gramling et al., 2004; IOD, 2016; Sarens, 2007). However, many years later, the question remains: has *IA* successfully played its new role? Despite being accepted as an important element of *CG*, *IA* and its effectiveness remain a rather unexplored area (Lenz et al., 2018; Mihret and Grant, 2017).

The aim of this paper is to investigate *IA* effectiveness, its determinants and its relationship with *CG*. Specifically, this study provides empirical evidence of *CG* drivers of *IAF* quality and the association between *IAF* quality characteristics and *CG* effectiveness. Previous studies have focused either on *IA* quality (Arrena and Azzone, 2009; Regoliosi and d'Eri, 2014) or the factors that shape its effectiveness (Alzeban and Gwilliam, 2014; Sarens et al., 2012). Our contribution to the study of *IA* and its relationship with *CG* involves the investigation of two effects, helping us discuss the role of *IA* within *CG*. We assess two aspects of the *IA*-*CG* relationship in a unified framework, jointly examining the impact of effective *CG* on the quality of the internal audit function (*IAF*) and the effect of *IAF* quality on the active role of *IA* in *CG*. A large part of the literature has investigated the connection between *IAF* and external audit (Al-Twaijry et al., 2004; Desai et al., 2010; Edge and Farley, 1991; Felix et al., 2001; Mat Zain et al., 2015) and between *IAF* and financial reporting quality (Johl et al., 2013; Lin et al., 2011; Mat Zain et al., 2006; Pizzini et al., 2015; Prawitt et al., 2009). In this study, we employ an integrated approach, assessing the connection between *IAF* and *CG* in total and we construct an index for measuring *IAF* quality as well as a composite measure for the effect of *IA* on *CG* effectiveness. We produce arguments about the importance of factors that have been identified in the literature and employ regression models to analyze data that we collected from 45 Chief Audit Executives (CAEs) in listed companies at the Athens Stock Exchange

(ASE).[1] The efficiency of the Athens Stock Exchange suffered a severe blow in the wake of the Greek government-debt crisis (Sensoy and Tabak, 2015). Limited capital market efficiency means that stock prices are not adequate in conveying all information relevant to the issuers of listed securities. In this context, the capital market cannot play efficiently its role as mechanism for corporate control and cannot provide shareholders with needed information for asset allocation decisions. These market conditions highlight the importance of corporate governance as custodian of shareholder interests (especially the small ones) and, therefore, the role of internal audit in shaping the quality of corporate governance.

Our contribution is twofold. First, our study is the first to deliver an analysis of the bidirectional relationship between internal audit and corporate governance. Second, we construct a novel index that captures all major aspects of *IAF*. Our findings demonstrate a strong effect of *CG* compliance on *IAF* quality but a weak effect of *IAF* quality on *CG* effectiveness through *IA*'s active role in *CG*. Specifically, the empirical results suggest that the independence of the *BoD*, the expertise of the audit committee, the participation of *IA* in audit committee's meetings and investment fund ownership have a significant effect on *IAF* quality. Furthermore, we find a significant effect of *IA* size and internal auditor's training on *IA*'s active role in *CG*. This evidence shows that, while *IAF* quality is affected by the implementation of *CG* guidelines in a company, *IAF* quality itself cannot efficiently affect *CG* quality (even though *IA* is one of the four key players in *CG*). However, we found that the effect of *IA* on *CG* depends on factors external to *IAF* (like firm size, internationalization and *CEO* duality), indicating that the impact of *IA* is not as strong as expected. These results bear implications for corporate leaders, *IA* professionals and regulators who effectively delineate and implement *IA* and *CG*.

The rest of the paper proceeds as follows. Section II presents information about corporate governance and internal audit in Greece. Section III presents prior research and conceptual framework, while section IV provides the theoretical background and develops the hypotheses to be tested. Section V discusses the methodology, the sample and presents the research models. Section VI presents the results

1. Chief audit executive describes the role of a person in a senior position responsible for effectively managing the internal audit activity in accordance with the internal audit charter and the mandatory elements of the International Professional Practices Framework (IIA, 2017, p.21).

of the empirical analysis, while section VII reaches a conclusion and discusses limitations and suggestions for future research.

II. The case of Greece

Our analysis is based on many international studies that addressed questions of *IA* quality and effectiveness (Alzeban and Gwilliam, 2014; Al-Twaijry et al., 2004; Arena and Azzone, 2009; Corbella et al., 2015; Goodwin-Steward and Kent, 2006; Johl et al., 2013; Mat Zain et al., 2015; Mihret and Yismaw, 2007; Regoliosi and d'Eri, 2014; Soh and Martinov-Bennie, 2011). We perform a country-specific analysis, since there are substantial differences across countries which account for differences in the effective implementation of *IA* and *CG* (Paape et al., 2003; Regoliosi and d'Eri, 2014). Moreover, a country-specific analysis can shield our analysis against the fact that internal auditors may interpret professional standards differently in various countries, which may lead to cross-national inconsistencies (Mat Zain et al., 2015). Our paper is a response to previous studies that have highlighted the need to explore *IA* variations across countries as articulations of diverse institutional frameworks (Sarens and Abdolmohammadi, 2011).

Prior research on *IA* and *CG* in Greece is limited. The effective implementation of *CG* in Greece has been doubted (Spanos, 2005). *CG* quality is rather low with respect to international best practices (Lazarides and Drimpetas, 2011), as Greek companies exhibit increased compliance with mandatory *CG* guidelines (legal regulations) but limited compliance to optional ones (Florou and Galarniotis, 2007). This, in part, can be attributed to inconsistencies and vagueness in the set of principles and laws, which produce difficulties for companies that try to implement *CG* principles (Lazarides, 2010). Furthermore, in family-controlled companies, which constitute the biggest part of entrepreneurship in Greece, *CG* is not effective (Spanos et al., 2008), probably because the principal drivers of *CG* quality in Greece are company size, leadership, power concentration and the characteristics of the board of directors (*BoD*) (Lazarides and Drimpetas, 2011). Ownership structure in Greece differs from Anglo-Saxon countries, since it is not affected by *CG* mechanisms, the regulation and an external market for corporate control, but mostly by a company's historical trajectory, its organizational structure and the power-control balance within the company (Lazarides et al., 2009). This probably

accounts for recent empirical evidence on the Athens Stock Exchange, which showed that companies with more independent *BoD* members exhibit decreased firm performance, whereas *BoD*s more often advise than monitor a company's management (Zhou et al., 2018).[2]

With respect to *IA* in Greek companies, prior research has been rather limited and inconclusive. The implementation of *IA* principles and international standards is a useful instrument for improving corporate competitiveness, which can help Greece in its track out of the recessionary spiral of the last decade (Kontogeorgis and Filos, 2012). As the Greek economy exhibits signs of recovery, the most important role for *IA* is to identify and assess essential sources of risk for Greek companies, while its contribution to the architecture of *CG* is also fundamental. Regarding the role of internal audit, Bekiaris et al. (2013) highlighted the importance of *IA* involvement in the identification and assessment of critical risks. In such macroeconomic and entrepreneurial environment, corporate downsizing is frequent and highlights the importance of an effective *IA* system (Koutoupis and Kakkos, 2011), effectiveness being shaped by objectivity, the competence of internal auditors and management support for *IA* (Drogalas et al., 2015). Furthermore, internal audit quality and internal audit senior management support have been found to be associated with enhanced corporate governance effectiveness in Greek firms listed in the Athens Stock Exchange (Drogalas et al., 2018). A survey of Greek firms was also conducted by Koutoupis and Pappa (2018), who concluded that internal audit processes, risk assessment, control activities, information and communication, and monitoring activities lead to corporate governance effectiveness. However, while most of prior research about *IA* and *CG* in Greece highlights the contribution of *IA* to *CG* effectiveness, no study has so far explored the effect of *CG* on the quality of *IA* in Greek listed companies, and our contribution includes the exploration of a directed causality (causality running from *CG* to *IA*) in the Greek capital market, which constitutes an interesting terrain for the analysis of *IA* and *CG*.

In brief, the case of Greece exhibits many interesting characteristics: (1) The global economic crisis of 2008, combined with the subsequent sovereign debt crisis in Greece and the Eurozone, highlighted the need

2. However, international evidence on the effect of corporate governance quality on financial performance is not unanimous. See, e.g., Wessels et al. (2016).

to investigate *CG* and *IA* in Greek companies (Mertzanis et al., 2019);[3] (2) Greece is located on an interesting spot on the border that separates developed and developing economies. On the one hand, it is a member of the Eurozone and OECD, exhibiting structural qualities of developed economies and, on the other hand, it is considered a developing country by MSCI due to reasons grounded upon stock market size, liquidity and institutional environment. Prior research has highlighted the importance of discussing *IA* and *CG* in diverse institutional settings, such as those that emerge in developing economies (e.g., Alzeban and Gwilliam, 2014; Al-Twaijry et al., 2004; Mat Zain et al., 2015); (3) Greek companies use an internal system of *CG* (European system) where, in contrast to the external system (Anglo-Saxon system) that is implemented in the UK and USA (Weimer and Pape, 1999), *CG* guidelines are largely optional. Therefore, it is interesting to explore *CG* in Greece and especially the degree in which Greek companies have understood the advantages of *CG* and have proceeded to its implementation, regardless of the mandatory character of the guidelines; (4) Greek companies use a one-tier *CG* system, where executive and non-executive directors are members of the same board (*BoD*), in contrast to the two-tier system, where management executives participate in the Management Board and non-executive "supervisors" participate in the Supervisory Board (Paape, 2007). These structural differences highlight the fact that, in the one-tier system, financial reporting and *IA* must cope with bigger agency problems, since the management executives who run a company's daily operations are also involved in shaping the company's strategy through their participation in the *BoD*; (5) Most Greek companies remain family-controlled, with a single shareholder holding most of the shares, thereby increasing his influence in matters of company strategy and control systems. Moreover, the major shareholder is also often the *CEO*, thereby having the opportunity to take advantage of inside information and make profits at the expense of minority shareholders (Regoliosi and d'Eri, 2014). This framework makes the Greek case even more interesting, since agency theory is relevant not only in the context of the principal-agent

3. The Greek crisis, even though it was primarily fiscal, is directly associated with *CG*, since it is aggravated by the failures of a *CG* system. The need for good *CG* is intensified in times of crisis, since *CG* contributes to a business environment of trust, accountability and transparency, which are prerequisites for long-term investments, financial stability and, ultimately, economic development. Therefore, there is policy, academic and corporate interest in investigating *CG* effectiveness in Greece, where it is imperative to implement good *CG*.

problem but also in the context of principal-principal conflicts (HCGC, 2013; AL-Qadasi et al., 2019);[4] (6) Finally, Greek companies are indebted, exhibiting high levels of financial leverage in a bank-centric system of corporate financing. This is in sharp contrast to the USA where more corporations seek financing in stock markets (Sarens and Abdolmohammadi, 2011). Therefore, agency theory can be applied in *CG* not only to shed light on agency costs of equity but also on agency costs of debt.

III. Prior research and conceptual framework

Major corporate scandals have highlighted the need to strengthen the regulatory framework to regain investor confidence. As a result, many guidelines, codes and regulations were issued worldwide, evolving around the 2002 Sarbanes-Oxley Act (SOX) in the USA, which established a broad range of measures that set the ground for effective *CG*. One of the principal consequences of corporate scandals was the increase in the requirements for the internal safety of *CG* processes, risk management and internal control (Sarens, 2009; Soh and Martinov-Bennie, 2011). In the years that followed, *IA* received increased attention as a decisive determinant of *CG* effectiveness and the quality of financial reporting (Leung et al., 2004; Prawitt et al., 2009; Sarens and De Beedle, 2006; Soh and Martinov-Bennie, 2011). A few years after the scandals, Allegrini et al. (2006), Cooper et al. (2006) and Hass et al. (2006) conducted extensive literature review on *IA* research in Europe, Asia, Australia and USA. One conclusion in common was that *IA* had become a permanent part of *CG*, particularly

4. Family-controlled firms face severe agency problems between controlling and non-controlling shareholders (Ali et al., 2007), since the controlling position of the founding family enables them to use their power to serve private benefits at the expense of non-controlling shareholders (Prencipe and Bar-Yosef, 2011). There is no commonly accepted definition for classifying a company as family-controlled. Most studies identify family control based on the participation of family members in the shareholding structure, and/or their participation in the *BoD* and/or top management (e.g., Ali et al., 2007; Chen et al., 2008; Prencipe and Bar-Yosef, 2011). In our survey, in 66.67% of the cases family ownership is at least 30%, while in more than half of the companies, family ownership exceeds 50%. Family–controlled firms can benefit from the results of our study by identifying the parameters of *CG* that can improve the *IAF* quality, as well as *IA* factors that can contribute to the effectiveness of *CG* in order to mitigate the intensity of agency problems between controlling and non-controlling shareholders.

after the increased attention that was given to *CG* effectiveness and various *CG* guidelines. While SOX does not directly refer to *IAF*, it has reinforced the role of *IA* as an element of *CG*, since it set increased audit responsibilities for audit committees and accountability requirements for *BoD* and management (Christopher et al., 2009; Prawitt et al., 2009). In fact, SOX substantially affected the role of *IA* in listed companies in the USA, resulting to an *IAF* that ranges from supervising, constant monitoring and assessing project outcomes to an advisory role in designing a project (IIA, 2004; Pitt, 2014).

Gramling et al. (2004) have highlighted the importance of *IA* in improving *CG* quality and Sarens (2009) produced a response to the question "When can we talk about an effective *IAF*?", answering "When *IAF* quality has a positive impact on the quality of corporate governance". Quality in governance is achieved when the company focuses on all *CG* players, placing however heavier emphasis on *IAF*, as *IAF* is essential in monitoring and shaping *CG* quality (Yassin et al., 2011). The contribution of *IA* to *CG* is mostly about reducing agency costs. Prior research in accounting and auditing has documented that management can appropriate resources at the expense of other stakeholders (e.g., Sarens and Abdolmohammadi, 2011). From the point of view of agency theory, the importance of strong *CG* structures relies on the need to align the interests of management with those of the other stakeholders, thereby reducing agency costs. Since complete alignment is not possible, various mechanisms are employed to monitor management (Cohen et al., 2002). Such mechanisms involve independent *BoD* members and chairman, an effective audit committee, external audit and *IA*.[5] In the literature these structures are called *CG* key players or *CG* cornerstones (Gramling et al., 2004; Goodwin-Steward and Kent, 2006, Prawitt et al., 2009). However, among these structures, only management and *IA* are involved in the day-to-day operations within the company. Therefore, since management sometimes imposes agency costs on other stakeholders, *IA* is the fundamental function that is responsible for monitoring management (Prawitt et al., 2009). This highlights the special role of *IA* in *CG* and stresses the importance of an effective *IAF*. These arguments have shaped the evolution of *IA* so that *IA* can respond to new requirements and its expanded role within *CG*.

5. Audit committees have also been found to bear a positive effect on the efficiency of investment decision making (Choi et al., 2017).

IA academics and professionals have suggested that *IA* must undergo major changes to add value to the company. Sarens et al. (2011, p.59) argued that "We wait for a critical evaluation of whether traditional *IA* activities are still able to meet the current needs of organizations". According to the definition of *IA* by the Institute of Internal Auditors (IIA), internal auditing is an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance processes (IIA, 2017). This definition was put forward in 1999 to account for the expanded role of *IA* that has undergone major changes, extending beyond monitoring, to risk management and *CG* (Goodwin-Stewart and Kent, 2006).

According to IIA Standard 2100, which refers to the nature of *IA* work, *CG* and risk management are two of the three fundamental pillars of *IAF*, along with control processes (IIA, 2017). IIA, in a position paper in 2006, has provided clear guidelines for the integration of *IA* in *CG* (IIA, 2006). In the context of the Internal Audit Quality Assessment of HM Treasury in the UK, the contribution of *IA* to *CG* and risk management is one of the seven pillars that are used in the assessment of *IA* outcomes (HM Treasury, 2013). In the King IV Code for Corporate Governance in South Africa, *IA* is identified as a key governance factor and is proposed as a reliable advisor for all company operations (IOD, 2016). The role of *IA* in monitoring and improving risk management and the internal control system constitutes an important contribution of *IA* to *CG* (Sarens and De Beedle, 2006), since risk management and internal control are two important elements of *CG* (Sarens, 2009). Moreover, the assurance services of *IA* play an important role in *CG*, as they integrate management's accountability to the *BoD* and improve the quality of reported earnings (Gramling et al., 2004).

Apart from being a key *CG* player, *IA* can provide support to the rest of *CG* players. Therefore, *IA*'s position in the *CG* structure can be approached in two ways. On the one hand, *IA* is a fundamental component of *CG*; it is responsible for assessing the effectiveness of *CG* models and risk management (Lin et al., 2011). According to the International Standards of Auditing, the principal objectives of *IAF* include the assessment of governance vis-à-vis the accomplishment of governance objectives with respect to ethics and values, performance

management and accountability, targeted information disclosure about risks and effective communication between the parties that implement *CG* (IFAC, 2009a). Furthermore, IIA Standard 2110 explicitly refers to the obligation of effective *IAF* to provide assurance with respect to the suitability of *CG* processes, including the provision of proposals for improvement (IIA, 2013).

On the other hand, *IA* serves as a resource for all *CG* players (Gramling et al., 2004; Yassin et al., 2011). Specifically, *IA* helps the audit committee (Arena and Azzone, 2009; Gramling et al., 2004; Sarens, 2007) and external audit (Arena and Azzone, 2009; Gramling et al., 2004; Yassin et al., 2011) to achieve their objectives and fulfil their obligations. *IA* also contributes to the accomplishment of management's objectives through advisory services and operating audits (Gramling et al., 2004; Sarens, 2007; Yassin et al., 2011). Overall, most prior studies advocate that the role of *IA* in *CG* takes place through its relationship with the rest of *CG* players.

The relationship between key *CG* players is fundamental for the effectiveness of the *CG* system. Cohen et al. (2004) describe the complex interactions between *CG* mechanisms as "corporate governance mosaic". Given its special position in the organization, *IAF* is capable of actively contributing to *CG* as one piece of this mosaic (Soh and Martinov-Bennie, 2011), mostly through interacting with other *CG* players (Sarens et al., 2012). Among the four *CG* players, the audit committee requires special attention when it comes to *IA*. Soh and Martinov-Bennie (2011) characterize the audit committee as "key internal corporate governance stakeholder with primary responsibility for the oversight of the *IAF*". On the one hand, it is considered as one of the four cornerstones of *CG* (along with *IA*, management and external audit), it operates jointly with the other parts and it relies heavily on *IA*. On the other hand though, researchers have argued that the audit committee bears substantial impact on *IAF* quality (Gramling et al., 2004; Mat Zain et al., 2006; Soh and Martinov-Bennie, 2011); while a strong *IAF* can contribute to the effectiveness of the audit committee, an effective audit committee can strengthen the position of *IAF* in the company (Arena and Azzone, 2009; Goodwin-Steward and Kent, 2006). In the interviews that were conducted by Soh and Martinov-Bennie (2011), both the chairmen of audit committees and CAEs agreed that the audit committee should strengthen and support the position and status of *IAF* within the company, giving CAE the opportunity to present the findings of *IA* in committee meetings. This evidence implies that *IA* is

seen as an important function within the company that employs the necessary support and environment to achieve its objective (Ruud, 2003; Gramling et al., 2004). That being the case, the support that is provided by the audit committee and its active participation in *IAF* is a key determinant of *IA* effectiveness (Pizzini et al., 2015; Prawitt et al., 2009). Therefore, the operation of the audit committee should be taken into account in the assessment of *IAF* quality (Cohen et al., 2004; Gramling et al., 2004).

The change in *IA*'s role has attracted academic attention and spawned empirical evidence from a plethora of studies across diverse national economies. Even though in the USA and Australia the findings clearly indicate the adoption of *IA* in accordance to its definition, European evidence has been ambiguous (Allegrini et al., 2009); there is however some evidence of companies' efforts to extend *IA* implementation and adopt new processes (Arena and Azzone, 2009; Paape et al., 2003; Sarens and De Beedle, 2006; Sarens, 2007). The change in *IA*'s mission and role forces companies to reorient *IAF* processes, policies and qualifications (Arena and Azzone, 2009). *IAF* quality is directly relevant to *IA* adding value to the company and contributing to *CG* (Gramling et al., 2004). Therefore, a large part of research on the contribution of *IA* to *CG* focuses on *IAF* quality (Arena and Azzone, 2009; Regoliosi and d'Eri, 2014; Sarens, 2009, Soh and Martinov-Bennie, 2011). The high quality of *IAF* increases the probability of collaboration between internal and external audit either by using *IAF* staff in audits or by using results from previous audits. This situation can bring about several improvements, such as the decrease in audit delays (Pizzini et al., 2015), the decrease in audit fees (Mat Zain et al., 2015), the decrease in earnings management (Johl et al., 2011; Prawitt et al., 2009) and the disclosure of major weaknesses in financial statements (Lin et al., 2011). A common element in all these cases is that *IAF* quality helps improve the quality of financial reporting and accounting information in general.

To sum up our research draws on the position and role of *IA* within the company. While *IA* used to be a function of internal assurance, it evolved into a reliable advisor that adds value to all cornerstones of *CG*. However, most prior research on the effect of *IA* on *CG* focuses on the relationship between *IA* and external audit (Al-Twaijry et al., 2004; Mat Zain et al., 2015; Pizzini et al., 2015; Prawitt et al., 2009). On the other hand, *IA* plays a double role in *CG* since it is one of the four cornerstones of *CG* and, moreover, it is used as a resource by the other

three cornerstones. Prior research has assessed either the effect of *CG* on *IA* or the effect of *IA* on *CG* (e.g., Regoliosi and d'Eri, 2014; Sarens et al., 2012). In this paper, we develop and test a conceptual framework that accommodates both dimensions, placing special emphasis on *IAF* quality.

IAF quality is difficult to assess due to the intangible nature of the audit process and, therefore, the choice of the evaluation method is very important. A widely used evaluation approach is based on the contribution of *IA* to the work of the external auditor. In this case, *IAF* quality is assessed by focusing on various factors which, according to external auditing standards (ISA 610 revised/ SAS No.128 revised/ AS 2201 revised), must be examined by external auditors before they employ the *IAF* in the audit of financial statements (IFAC, 2009b; AICPA, 2014; PCAOB, 2016a).[6] IIA Standard 1300 suggests another way to evaluate *IAF*, the quality assurance and improvement program (QAIP) (IIA, 2013). Even though it is a useful instrument in monitoring the *IAF*, it focuses mostly on procedural matters (audit completion, feedback, project delivery on time etc) and not on quality characteristics of *IAF*.

In the "managing the *IAF*" chapter of an IIA report, there is reference to two ways to assess the value of *IAF*, a quantitative (the number of reports issued, percent of the work plan completed, percent over/under budget, etc.) and a qualitative one (surveys, based on questionnaires and interviews with third parties on the evaluation of *IAF* services) (Bailey et al., 2003). Abdolmohammadi (2009) argues that the professionalization of *IAF* staff -defined as IIA membership and holding professional certifications- is an important element of *IAF* quality. The importance of professionalization, as key determinant of *IAF* quality, is also documented by Arena and Azzone (2009), while Al-Twaijry et al. (2004), Mat Zain et al. (2006), Mihret and Yismaw (2007) and Sarens (2009) refer to *IA* professionals as experienced and trained staff. Sarens, in his 2009 editorial in the International Journal of Auditing, argues that *IAF* quality is articulated in two dimensions: a) the relationship between *IAF*, the *BoD*, the audit committee and management and the implemented audit methodologies and techniques and b) the personal characteristics of internal auditors.

While *IAF* quality is very important, it lacks an established

6. These standards are based on principles that focus on three groups of characteristics: competence, objectivity, work performance.

measurement framework (Bailey et al., 2003; Paape, 2007). As *IAF* quality is shaped by a plethora of factors, prior research has not reached a conclusion about a single set of factors, but, instead, the assessed determinants of *IAF* quality differ across the authors, depending on diverse criteria. Finally, some authors have used separate measurements for different *IAF* quality characteristics (Alzeban and Gwilliam, 2014; Al-Twaijry et al., 2004; Arena and Azzone, 2009; Lin et al., 2011), while others have produced a composite measure of *IAF* quality and this is the debate that this paper is a part of (Johl et al., 2013; Mat Zain et al., 2015; Pizzini et al., 2015; Prawitt et al., 2009; Regoliosi and d'Eri, 2014).

IV. Instrument development

A. Measurement of internal audit function quality

The assessment of audit quality relies to a great extent on the choice of the characteristics of *IAF* quality that are to be evaluated. Gramling et al. (2004) reached the conclusion that most studies in the literature associate *IAF* quality and external audit. This conclusion has not substantially changed during the last fifteen years and this accounts for the fact that many authors still rely on external auditing to select *IA* characteristics that are to be assessed (Johl et al., 2013; Lin et al., 2011; Mat Zain et al., 2015; Pizzini et al., 2015; Prawitt et al., 2009). Apart from external auditing standards, the literature is a frequent source of information (e.g., Alzeban and Guilliam, 2014; Al-Twaijry et al., 2004; Arena and Azzone, 2009; Regoliosi and d'Eri, 2014), while other studies employ IIA Standards (Gramling and Vandervelde, 2006; Sarens et al., 2012). We based our measure of *IAF* quality on three sources. Our principal source is the literature. We also relied on IIA standards and external auditing standards. Furthermore, our measurement instrument was extensively discussed with *IA* professionals through a brainstorming procedure, shaping an outcome which reflects nine quality characteristics of *IA*, which can be organized into four groups: the relationship of *IAF* with *BoD* and management, *IA* methodology, *IA* investment and the competence of internal auditors. According to the classification of Sarens (2009), the first three categories refer to *IA* as a whole, while the fourth category refers to the specific characteristics of internal auditors.

The relationship of IAF with BoD and management

In this group we included two out of nine quality characteristics of *IAF*, namely *IA* independence and management's response to *IA*'s findings and recommendations. Independence is the most important criterion for the assessment of *IA* objectivity (Gramling et al., 2004) and can be represented with many factors. In prior research, the most frequently employed factor is the level of the organization to which *IA* functionally reports (e.g., Alzeban and Gwilliam, 2014; Gramling and Vardervelde, 2006; Lin et al., 2011; Pizzini et al., 2015; Soh and Martinov-Bennie, 2011). Moreover, the Institute of Internal Auditors (IIA, 2017), in Standards 1100 (Independence and Objectivity) and 1110 (Organizational Independence), explicitly states the need for an independent *IA* opinion and places emphasis on the reporting relationship between *IAF* and *BoD*. The Hellenic Corporate Governance Code states that the internal audit unit should be independent from the rest of the operational units and report administratively to the *CEO* and operationally to the audit committee (article B.1.2.). Finally, *IA* independence and the level of *IA* reporting is often present in external auditing standards on the assessment of *IAF* by an external auditor (ISA 610-A4/ SAS 128-A7/ AS 2605-10), namely on the set of factors that the external auditor must assess during the evaluation of *IAF* performance (IFAC, 2009b; AICPA, 2014; PCAOB, 2016b). As a result, to proxy for independence we use a binary variable indicating whether the CAE of the *IAF* reports to the audit committee (Prawitt et al., 2009; IOD, 2009).

Management's response to *IA*'s findings and recommendations is another characteristic that has attracted the interest of prior research (e.g Mihret and Yismaw, 2007; Lin et al., 2011; Soh and Martinov-Bennie, 2011; Alzeban and Sawan, 2015). Furthermore, in IIA Standard 2500 (Monitoring Progress) and external auditing standards (ISA 610-A4/ AS 2605-10), management follow-up to *IA*'s reports is recognized as an essential element of the assessment of *IA* effectiveness (IIA, 2017; IFAC, 2009b; PCAOB, 2016b).

IA methodology

To capture the importance of *IA* methodology, we focused on two characteristics for the assessment of *IAF* quality, namely the use of the *IA* manual and the implementation of risk-based audit. The manual is a

key element of company methodology on *IA* and, jointly with other factors, it could have a substantial impact on ability of *IAF* to effectively monitor and improve risk management and internal control (Sarens, 2009). Moreover, the International Standard of Auditing 610-A4 recognizes the importance of the *IA* manual in the evaluation of *IAF* by external auditors (IFAC, 2009b). Finally, the importance of the manual was highlighted in our discussions with *IA* professionals, since they consider it a useful instrument for a proper *IAF*.

The program for risk-based audit is considered very important for proper and effective *IAF* (Arena and Azone, 2009; Sarens, 2009; Sarens et al., 2012). The reason is that the implementation of such a program contributes to the achievement of the principal objective of *IA*, which is the implementation of a systematic approach to the evaluation and improvement of risk management processes, internal control and governance (IIA, 2017). Finally, the importance of the risk-based program is also stressed in IIA Standard 2010 (Planning), according to which the CAE must establish a risk-based auditing plan, in order to align *IAF* priorities and company objectives (IIA, 2013).

IA investment

An *IAF* that is adequately financed can audit a larger part of company transactions (Prawitt et al., 2009). Furthermore, a larger number of internal auditors in *IAF* results in greater rotation, which contributes to their objectivity (Arena and Azzone, 2009). *IAF* operating costs is one way to measure *IA* investment (Prawitt et al., 2009; Lin et al., 2011; Johl et al., 2013; Pizzini et al., 2015). However, information on budget or on the expenses of a specific operation is considered sensitive, which is likely to reduce participant response in our study (Goodwin-Steward and Kent, 2006).

Therefore, and in line with prior research, we chose *IAF* staff (number of internal auditors) as a measure of *IA* investment (e.g., Goodwin-Steward and Kent, 2006; Mat Zain et al., 2006; Alzeban and Gwilliam, 2014; Mat Zain et al., 2015), to increase participant response. Our choice is also supported by the fact that, according to the Statement on Auditing Standards 128-A8, the proper number of internal auditors in the *IAF* (based on company size) is an important measure for the evaluation of *IA* effectiveness by external auditors (AICPA, 2014). This was also corroborated by Al-Twaijry et al. (2004) who found that the size of the *IAF* is a significant criterion for external auditors in their decision to rely on the work of internal auditors for their own audits.

Internal auditors' competence

In our "competence" group we include four characteristics of internal auditors: experience, education, training and professional certifications. Prior research places emphasis on experience (e.g., Al-Twaijry et al., 2004; Prawitt, 2009; Sarens et al., 2012; Johl et al., 2013; Alzeban and Gwilliam, 2014; Mat Zain et al., 2015). *IA* experience is a fundamental element of *IAF* quality and performance (Ziegenfuss et al., 2006; Regoliosi and d'Eri, 2014). Furthermore, in external auditing standards (SAS 128-A8/ AS 2605-09), the experience of internal auditors is an important factor in the evaluation of *IAF* (AICPA, 2014; PCAOB, 2016b). Prior studies have suggested many ways to measure *IA* experience.[7] In this paper, we measured this element with the average experience of internal auditors (including CAE) in order to have a more representative account of *IA* experience (Prawitt et al., 2009; Lin et al., 2011; Pizzini et al., 2015). Furthermore, in the years of professional experience we included not only *IA* experience, but also experience in external audit, since it contributes to *IA* effectiveness (Lin et al., 2011 made a similar choice).

The level of academic education is the second characteristic that we included in our measure of *IA* competence (Al-Twaijry et al., 2004; Sarens, 2009; Lin et al., 2011; Alzeban and Gwilliam, 2014; Pizzini et al., 2015). External auditing standard AS 2605-09 recognizes the educational level of internal auditors as a factor that should be considered by external auditors in their decision to make use of *IAF* output (PCAOB, 2016b). The estimation of the educational level was based on the average number of years spent by internal auditors in undergraduate and graduate education (Lin et al., 2011; Pizzini et al., 2015).

Internal auditors' training includes seminars, conferences, online education and other forms of training. It is an important element of internal auditors' professional education and it is essential in the effectiveness of their work and, therefore, in the quality of *IAF* services (e.g., Prawitt et al., 2009; Lin et al., 2011; Alzeban and Gwilliam, 2014; Pizzini et al., 2015; Mat Zain et al., 2015). Apart from academic arguments, the importance of continuous training for internal auditors

7. Regoliosi and d'Eri (2014) and Johl et al. (2013) measured experience with the number of years that *IAF* existed in a company. Another way of measurement is the number of years of professional experience of a company's CAE (Sarens et al., 2012; Mat Zain et al., 2015).

is also stressed in IIA Standard 1230 on Continuing Professional Development (IIA, 2013). Finally, internal auditors' training is an important factor for the assessment of *IAF* according to external auditing standards (SAS 128-A8/ AS 2605-09) (AICPA, 2014; PCAOB, 2016b). In this study, we used the average number of training hours per internal auditor on a yearly basis, following the methodological approach of Lin et al. (2011) and Pizzini et al. (2015). We did not include professional certifications as we account for them with a separate variable.

The last characteristic that we incorporated in our measure for *IAF* quality involves the professional certifications of a company's internal auditors. Prior research has often explored professional certifications as an important element of either *IAF* effectiveness (Arena and Azone, 2009; Sarens et al., 2012; Alzeban and Gwilliam, 2014) or *IAF* quality (e.g., Ziegenfuss et al., 2006; Prawitt et al., 2009; Lin et al., 2011; Regoliosi and d'Eri, 2014, Pizzini et al., 2015). The importance of professional certifications is also stressed by IIA standard 1210 on Proficiency (IIA, 2017) and external auditing standards (SAS 128-A8/ AS 2605-09) (AICPA, 2014; PCAOB, 2016b). For the same reasons that our measure on experience included prior work on both internal and external auditing, here we included all auditing certifications (internal and external). As a result, our measure on certifications is based on the number of internal auditors that hold some certification in auditing.

IAFQ Index

We measured *IAF* quality with an index that is the sum of nine binary variables.[8] Every variable reflects a characteristic and takes the values 0 or 1.[9] Therefore, the value of the index ranges from 0 (minimum quality) to 9 (maximum quality). Our index is:

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8. We applied the same weight for each variable, since prior research has delivered mixed evidence on the relative importance of each variable (Pizzini et al., 2015). Drawing on Prawitt et al. (2009), in our approach diverse weights are reflected in the presence of broad categories in multiple variables (e.g., internal auditors' competence is present in four variables).

9. To express *FREQ*, *IA_SIZE*, *ACADEMIC*, *TRAINING* and *CERT* in binary form, we employed dichotomization based on the sample median (Prawitt et al., 2009; Mat Zain et al., 2015; Al-Jaifi et al., 2019), where the variables are split at the median to form high and low groups.

$$IAFQ = FRL + FREQ + MANUAL + RISK\_BASED + IA\_SIZE$$

$$+ EXP + ACADEMIC + TRAINING + CERT,$$

where *IAFQ* reflects the quality of *IAF* and constitutes the dependent variable in our model that explores the determinants of *IAF* quality. The remaining variables were measured as following: *FRL* indicates the *IAF* reporting line. It equals one if *IA* reports to the audit committee, and zero otherwise; *FREQ* reflects the frequency with which management responds to *IA*'s findings and recommendations. Frequency was measured with a four-point scale that ranges from 1 (management never responds) to 4 (management always responds). *FREQ* equals one if the management's response is above the sample median, and zero otherwise; *MANUAL* indicates the existence of *IA* manual. It equals one if there is an *IA* manual, and zero otherwise; *RISK_BASED* indicates the implementation of a risk-based audit program. It equals one if such a program is implemented, and zero otherwise; *IA_SIZE* reflects *IAF* size, measured with the ratio of internal auditors over the total number of company employees. It equals one if *IAF* size is above the sample median, and zero otherwise; *EXP* reflects the experience of a company's internal auditors. It equals one if the auditors' average experience is greater than the years of an internal auditor's professional maturity (7 years), and zero otherwise; *ACADEMIC* reflects the average number of years in undergraduate and graduate education for the company's internal auditors. It equals one if the number of years is above the sample median, and zero otherwise; *TRAINING* reflects the average number of training hours for a company's internal auditors, on a yearly basis. It equals one if the number of training hours is above the sample median, and zero otherwise; *CERT* reflects the ratio of internal auditors with professional certifications in auditing to the number of the company's internal auditors. It equals one if the value of the ratio is above the sample median, and zero otherwise.

B. The cross section of internal audit function quality (Model 1)

Prior research has associated *IAF* quality with four *CG* dimensions: the composition of the *BoD*, the composition of the audit committee, the commitment of the audit committee and the structure of shareholder ownership. Previous studies have identified many *CG* elements that

belong to these dimensions, can reflect the existence of "good" *CG* and are expected to be associated with *IAF* quality.

BoD composition

With respect to *BoD* composition, the size and the number of independent members bear a positive impact on *IAF* quality (Regoliosi and d'Eri, 2014). A well-structured *BoD* is more effective in the performance of its duties (Charitou et al., 2016), such as (in the case of *IA*) the appointment of internal auditors, the collaboration of *BoD* members with *IA*, the provision of necessary information and generally the support for *IAF*. Therefore, we expect *BoD* size and independent members to be positively associated with *IAF* quality. Additionally, the independence of the chairman of the *BoD* has been found to positively affect the size of *IAF* (Goodwin-Steward and Kent, 2006). Since the size of *IAF* is directly connected with company *IA* investment and, therefore, with *IA* quality (reflecting an adequately staffed *IA*), we expect *BoD* chairman's independence to be positively associated with *IAF* quality. These arguments lead to the following hypothesis:

> H1. Internal audit function quality is associated with the composition of the *BoD*.

Audit committee composition

An effective audit committee influences *IAF* quality and this is due to the responsibilities of the committee such as *IAF* monitoring, ensuring that *IAF* has access to the necessary information, approving the *IA* program and ensuring that *IA* is independent and objective. In this context, the independent members of the audit committee bear a positive impact on *IA* involvement in financial statement audits (Mat Zain et al., 2006). Given that the external auditors' decision to collaborate with *IA* depends on the assessment of *IAF* quality, we expect audit committee's independence to be positively associated with *IAF* quality. Moreover, the expertise of audit committee in accounting and auditing is associated with *IA* participation in financial statement audits (Mat Zain et al., 2006), highlighting the potential effect of this factor on *IAF* quality. This connection with *IA* is reinforced by the fact that the knowledge of audit committee members in accounting and auditing affects a company's decision to implement *IA* (Goodwin-Steward and Kent, 2006). Therefore, we expect audit committee's expertise to be positively

associated with *IAF* quality. Drawing on these arguments, we can put forward the following hypothesis:

> H2. Internal audit function quality is associated with the composition of the audit committee.

Audit committee commitment

The commitment of the audit committee is expected to affect *IAF* quality for two reasons. The first has to do with the frequency of audit committee meetings that tends to increase *IAF* size (Goodwin-Steward and Kent, 2006), which, as we argued, is directly affected to its quality. The second reason is *IA*'s participation in the committee meetings, which has been found to improve *IA* effectiveness and reduce earnings management (Arena and Azzone, 2009; Alzoubi, 2019). The interaction between *IA* and the audit committee improves the flow of information (Mat Zain et al., 2006) and reflects management's approach to *IA*. Drawing on these arguments, the following hypothesis are formulated:

> H3. Internal audit function quality is associated with audit committee commitment.

Composition of shareholder ownership

IAF quality has been found to be associated with the composition of a company's shareholder ownership and especially with the presence of foreign investment funds (Regoliosi and d'Eri, 2014). We cannot predict the effect of this variable. Even though one would expect that the presence of foreign investment funds would reinforce auditing mechanisms and lead to increased *IAF* quality, Regoliosi and d'Eri (2014) produce opposite findings. Based on these arguments, we put forward the following hypothesis:

> H4. Internal audit function quality is associated with the company's investment funds.

C. Measurement of the IA's role in CG

To capture the effect of *IA*'s active role on *CG* we constructed a binary variable that takes the value 1 if *IA* has an active role in *CG* and 0

otherwise (Sarens et al., 2012). Such estimations are often based on CAEs or other *IA* stakeholders' perceptions (Alzeban and Gwilliam, 2014; Mat Zain et al., 2006; Sarens et al., 2012; Vadasi et al., 2019). We employed a composite variable that captures multiple responses to limit the subjectivity that characterizes measures based on individual statements (Prawitt et al., 2009); to implement this we combined many elements with potentially increased objectivity in the responses (Arena and Azzone, 2009; Mat Zain et al., 2015; Martino et al., 2017). The elements that were employed in the estimation of this variable refer to reviews and audits that are performed by *IA* and are associated with *CG* practices and policies (Martino et al., 2017).

The participants were asked to assess -in a scale from 1 (none) to 4 (extensive)- *IA*'s involvement in eight fundamental governance reviews.[10] Then, for each company, we created a composite variable that was the sum of the company's score in each of the eight processes (minimum 8, maximum 32). Finally, the binary variable was constructed with a dichotomization based on the median (Prawitt et al., 2009; Mat Zain et al., 2015; Martino et al., 2017). Each company with a total score greater than the sample median received the value 1 and 0 otherwise. This process resulted in the *IA_CG* variable, which is the dependent variable in our model on the role of *IA* in *CG*.

D. The cross section of IA's role in CG (Model 2)

The active role of *IA* in *CG* (*IA_CG*) is associated with three dimensions of *IAF* quality: the relationship with *BoD* and management, investment in *IA* and the competence of internal auditors. Prior research has identified many elements of *IAF* quality that belong in these dimensions, reflect the potential existence of a high-quality *IAF* and are expected to be associated with *IA*'s role in *CG*.

The relationship of IAF with BoD and management

IA independence bears a positive impact on the quality of financial statements (Pizzini et al., 2015), on external auditors' decision to

10. Reviews of governance policies and processes in general, reviews of governance policies and processes that are related to the use of information technology in particular, audits of merger and acquisition processes, audits of the internal operations of external providers of major services, audits on ethics, reviews about the connection between company strategy and performance measures, assessments of executive directors' compensation, audits on environmental sustainability.

collaborate with *IA* (Al-Twaijry et al., 2004) and on *IA* effectiveness (Alzeban and Gwilliam, 2014). This happens since an independent and objective *IA* is free from third-party interventions and, therefore, can perform its task with improved efficiency and effectiveness. Based on these arguments, we expect *IA*'s independence to be positively associated with *IA*'s active role in *CG*. Moreover, with respect to the relationship between *IA* and management, management's response to *IA*'s findings and recommendations supports *IA* effectiveness (Mihret and Yismaw, 2007; Soh and Martinov-Bennie, 2011; Alzeban and Gwilliam, 2014), since it implies that management sees *IA* as a function that is essential for the company and not only as a mandatory implementation of legal requirements. When *IA* effectiveness increases, *IA*'s ability to perform its duty is improved. Therefore, we expect implementation of *IA* recommendations by management to be positively associated with *IA*'s active role in *CG*. Drawing on these arguments we put forward the following hypotheses:

H5. *IA*'s active role in *CG* is positively associated with the *IA*'s independence.

H6. *IA*'s active role in *CG* is positively associated with the implementation of *IA* recommendations by management.

IA Investment

Investment in *IA* is one of the factors that shape *IA*. Specifically, the size of *IAF* bears substantial influence on the quality of financial statements (Johl et al., 2013; Pizzini et al., 2015), the decision of external auditors to work with *IA* (Al-Twaijry et al., 2004; Mat Zain et al., 2006) and *IA* effectiveness (Arena and Azzone, 2009; Alzeban and Gwilliam, 2014). This proposition is based on the argument that an *IAF* that is staffed with an adequate number of internal auditors is more likely to function efficiently, since it can cover a larger range of audits and is more likely to detect a problem or an error. Based on these arguments, we formulate the following hypothesis:

H7. *IA*'s active role in *CG* is positively associated with *IAF* size.

Internal auditors' competence

Four characteristics of internal auditors determine their competence:

experience, education, training, and professional certifications. Prior studies suggest that internal auditors' experience is a significant determinant of their competence. However, evidence is inconclusive. There are studies that document a positive impact of internal auditors' experience on the quality of financial statements and *IA* effectiveness, because experience can help tackle various company problems (Alzeban and Gwilliam, 2014; Al-Twaijry et al., 2004; Mat Zain et al., 2006). Other studies, however, discovered that internal auditors' experience is associated with increased earnings management (Johl et al., 2013; Prawitt et al., 2009) and therefore bears a deteriorating effect on the quality of financial statements. One might reasonably expect that internal auditors' experience would be beneficial for *IAF* quality. However, one might attribute the connection with increased earnings manipulation to the fact that, as internal auditors get more experienced, they get increasingly tied to the management and, consequently, they may become less objective and foster earnings manipulation. Nevertheless, we expect internal auditors' experience to be positively associated with *IA*'s active role in *CG*.

The level of internal auditors' education tends to improve *IA* effectiveness (Al-Twaijry et al., 2004), as it strengthens the background of auditors who apply their scientific knowledge to solve company problems. Therefore, we expect internal auditors' education to be positively associated with *IA*'s active role in *CG*, even though Lin et al. (2011) reached the conclusion that highly educated auditors are negatively associated with disclosure of material weaknesses in financial statements. A possible explanation for this finding could be the fact that highly educated auditors help prevent errors in financial statements and, consequently, less weaknesses in financial statements tend to occur and be disclosed.

Internal auditors' training also bears a positive effect on the quality of financial statements (Prawitt et al., 2009), since continuous training in an evolving profession, such as *IA*, leads to better informed and more effective internal auditors. In a similar vein, Alzeban and Gwilliam (2014) discovered a positive effect of training on *IA* effectiveness. Based on these arguments, we expect internal auditor's training to be positively associated with *IA*'s active role in *CG*.

Finally, the professional certifications that internal auditors hold are associated with increased quality in financial statements and the active role of *IA* in *CG* (Prawitt et al., 2009; Sarens et al., 2012). This is because professional certifications in *IA* help auditors become more

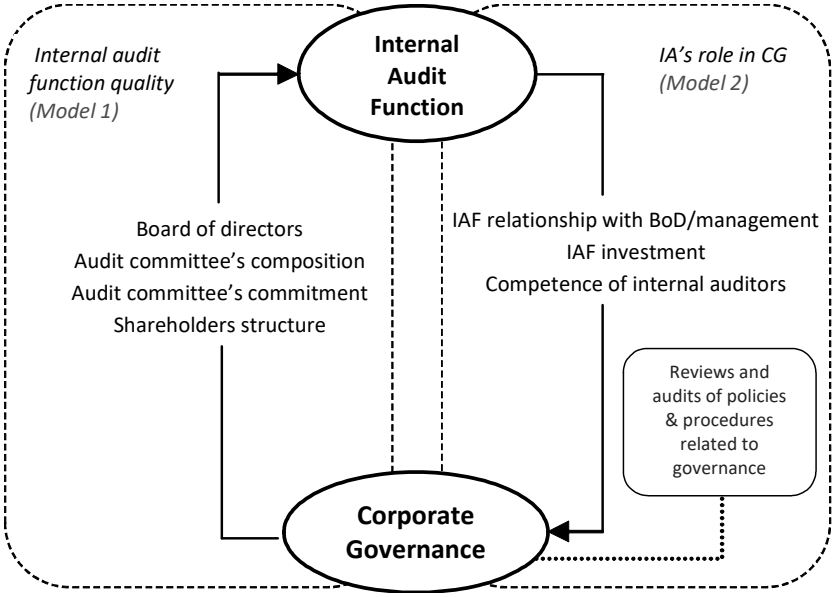

FIGURE 1.— Interdependence between internal audit function quality and corporate governance

specialized and, thereby, more effective. Therefore, we expect professional certifications to be positively associated with *IA*'s active role in *CG*. The aforementioned arguments lead to the following hypothesis:

H8. *IA*'s active role in *CG* is positively associated with internal auditors' competence.

Figure 1 provides a visual synopsis of our study, demonstrating the bidirectional association between *IA* and *CG*.

V. Research methodology

The investigation of our research questions was based on both non-publicly available information on *IAF* and evidence from annual reports at 2016 year-end, a methodological choice that has been frequently employed in previous research (e.g., Johl et al., 2013; Lin et

al., 2011; Prawitt et al., 2009). We collected non-publicly available information on *IAF* via empirical research in companies that were listed in the Athens Stock Exchange. We excluded financial companies (banks, insurance, financial services), as their institutional environment is highly regulated (Corbella et al., 2015; Regoliosi and d'Eri, 2014).

The fact that many stakeholders are interested in *IAF* quality (*IA* professionals, external auditors, management, shareholders, regulatory authorities) (Soh and Martinov-Bennie, 2011) highlights the importance of our study. However, the same fact is also a trap, since each of these stakeholders employs and assesses *IAF* quality in a manner that is varying and even competitive (Duncan and Trotman, 2014, Roussy and Brivot, 2016). Following the methodological footsteps of prior studies, we addressed the CAEs (e.g., Abbott et al., 2016; Alzeban and Sawan, 2015; Christopher et al., 2009; Nagy and Cenker, 2002; Sarens and De Beedle, 2006; Zaman and Sarens, 2013). These interested parties were chosen as the most appropriate source of information due to their central role in the *IA* process and their fundamental contribution to *CG*.

We collected data through a structured questionnaire (Abbott et al., 2016; Mat Zain et al., 2015; Pizzini et al., 2015; Regoliosi and d'Eri, 2014; Zaman and Sarens, 2013) and the survey was carried out via email. To maximize the questionnaire's suitability, we first presented it to two academics and two professionals with substantial experience in accounting and auditing. We conducted a preliminary discussion about the questions, to assess the questionnaire's technical adequacy, clarity, coherence and the suitability of its structure. Then, we performed all the necessary changes that were suggested by the experts, producing the first version of the questionnaire. Before sending the questionnaire, we pilot-tested it (Arena and Azzone, 2009; Paape, 2007), which meant that the survey was completed by five companies of our target population. Based on suggestions and comments that we got with the pilot test, we made a few more changes in the structure of the questionnaire and the formulation of the questions, to make it more comprehensible to the target group. This process led to the final form of the questionnaire, which consisted of five sections and 35 questions. The first section referred to company characteristics, the second referred to audit committee's information that is not easy to find in publicly available information, the third section included questions on the *IAF*, the fourth section included questions about CAE and internal auditors' competence and the fifth section included questions about the respondents' demographical characteristics (gender, age, profession, years of professional experience, professional certification etc.).

The population for our survey consists of 187 companies (all listed companies in the Athens Stock Exchange except financials). Before distributing the questionnaire, we contacted the companies via phone, to verify the existence of *IA* (Al-Twaijry et al., 2004; Arena and Azzone, 2009). Out of the 187 companies, one had closed during the period of our study, two companies had been delisted, three companies were under surveillance or in the process of being delisted, while we were not able to reach six companies (they did not respond to our phone calls/email). Furthermore, one company stated that they had stopped the production process and six companies stated that they had no *IA*. We contacted the CAE of its *IA* departments of the remaining 168 companies via phone, we provided all necessary information about the research and then we sent the questionnaire. We collected 51 questionnaires, with six of them being unsuitable to process due to missing answers. We ended up with 45 completed questionnaires that we assessed as suitable for processing and were the sample for our research; they represented 24.06% of the target population, a percentage that is comparable with similar studies in prior research (Carcello et al., 2005; Mat Zain et al., 2006; Sarens, 2007). The response rate to our research was 27.78%, while the most frequent reasons for not responding were the lack of available time and company policy of not responding to surveys. We compared the response rate with similar studies in the literature and found that it was adequate for the investigation of *IAF* in listed companies (Alzeban and Sawan (2015): 34%; Johl et al. (2013): 17.4%; Mat Zain et al. (2006): 17,9%; Mat Zain et al. (2015): 11,4%).

To detect the possibility of non-response bias we compared the responses between early and late respondents (23 and 22, respectively). We tested for differences between the two groups with a *t*-test for continuous variables (see appendix A, panel A) and a chi-square test for categorical variables (see appendix A, panel B). The results indicate no evidence of a response bias, as we did not find any significant difference between the two groups (*p* values were greater than 5%).

A. Internal audit function quality (Model 1)

Our dependent variable is the *IAFQ* index that we presented in section IV, Part *A* and it is an ordinal variable. Therefore, we employed an ordinal logistic regression model to assess the effect of "good" *CG* on

IAF (all model variables are defined in table 1, panel A):[11, 12]

$$IAFQ = \beta_0 + \beta_1 BoD\_SIZE + \beta_2 BoD\_INDEP + \beta_3 BoD\_CHAIR + \beta_4 AC\_INDEP + \beta_5 ACknowledge + \beta_6 ACmeetings + \beta_7 IApresense + \beta_8 OUT\_FUNDS + \beta_9 FIRM\_SIZE + \beta_{10} BIG4 + \beta_{11} REC\_INV + \beta_{12} LEV, \quad (1)$$

In this model we combined *CG* factors (predictor variables) with company characteristics (control variables). Predictor variables help us test our argument as outlined in section IV, Part *B*; the predictor variables that were employed in testing H1 (*BoD* composition) were *BoD_SIZE*, *BoD_INDEP* and *BoD_CHAIR*; the predictor variables that were employed in testing H2 (audit committee composition) were *AC_INDEP* and *ACknowledge*; the predictor variables that were employed in testing H3 (audit committee commitment) were *ACmeetings* and *IApresense*. We chose control variables that prior research has identified as significant. Company size is the most frequently used control variable in prior research (e.g., Arena and Azzone, 2009; Mat Zain et al., 2015; Sarens and Abdolmohammadi, 2011; Sarens et al., 2012). The size of the company (*FIRM_SIZE*) has been found to be positively associated with *IAF* quality (Regoliosi and d'Eri, 2014) and company investment in *IAF* (Carcello et al., 2005; Goodwin-Steward and Kent, 2006). Agency costs, which are targeted by *IA* processes, can stem from information asymmetry across different levels of company management. We expect that bigger companies exhibit a greater distance between top and middle-level executives, bigger agency problems and, therefore higher *IAF* quality is needed to

11. We took two methodological measures to tackle common method variance bias which comes about when all variables (dependent and independent) come from a single respondent: a) the dependent variable is based on a composition of objective measurements and not some measurement based on perceptions and b) data for some of the independent variables was collected from a secondary source (financial statements) (Sarens, 2007).

12. There is no multicollinearity problem in the data, since all tolerance values are greater than 0.1 and, respectively, all Variance Inflation Factor values are smaller than 10.

mitigate these problems.

The next control variable is *BIG*4 which refers to a company's external audit. External auditors' opinion triggers subsequent changes in corporate governance and leads to an increase in the turnover of the control mechanisms. The relationship between *IA* and external audit is important and can affect the quality of financial audits. *IAF* quality bears a positive impact on the quality of financial statements, via its effect on the restraint of earnings manipulation and its contribution to the reduction of audit delays (Prawitt et al., 2009; Pizzini et al., 2015). *IA* and external audit are employed as monitoring mechanisms for mitigating agency costs. It is often possible that the use of *IA* affects the required quality of external audit. Specifically, if there is an adequately staffed and effective *IAF*, *IAF* may replace a major audit firm, such as Big 4 (Delloitte, PwC, Ernst &Young and KPMG). Goodwin-Steward and Kent (2006) found that while the performance of external audit by one of the Big 4 does not seem to affect a company's decision to have an *IAF*, it is associated with smaller *IAF* size (when *IAF* is present). There is, however, another approach according to which *IA* operates as a complement and not as a substitute of external audit. Therefore, companies that face high risks and need strong audit mechanisms are likely to make large investments on both *IA* and external audit. Mat Zain et al. (2015) suggested that there is a positive association between *IAF* and audit firm fee. Drawing on all these arguments, we cannot make a prediction on the sign of the association between *IAF* quality and the Big 4 status of audit firm.

The last two control variables come from the companies' financial statements. The first variable is *REV_INC* which refers to financial statement risk. Higher levels of accounts receivable and inventory increase the risk of fraud and error in financial statements (Goodwin-Steward and Kent, 2006). Consequently, there is stronger need for audit mechanisms and high-quality *IAF*, since it plays an important role in financial statement auditing. Therefore, the effect of this variable on *IAF* quality is expected to be positive, since the level of receivables and inventory has also been shown to have a positive relationship with a company's decision to implement an *IAF* (Goodwin-Steward and Kent, 2006). Mat Zain et al. (2015) also corroborated this hypothesis, since they found that the level of a company's accounts receivable has a positive effect on the establishment of strong audit mechanisms.

The second variable that is associated with financial statements is

financial leverage (*LEV*). The agency conflict between creditors and owners-managers is fundamental in agency theory (Barnea et al., 1980; Leland, 1998; Hirth and Uhrig-Homburg, 2010). As a company gets more indebted there is an increasing need for monitoring through auditing. Drawing on the fact that increased leverage strengthens the need for external audit, Carcello et al. (2005) found that the increased need for auditing applies to *IA* as well. On the contrary, Goodwin-Stewart and Kent (2006) found a negative association between leverage and *IA*, while financial leverage has also been found to be irrelevant to both *IAF* size and quality (Sarens and Abdolmohammadi, 2011; Regoliosi and d'Eri, 2014). Despite conflicting evidence, leverage has often been examined in prior research on *IA*. We chose to include leverage in our model because, compared to the USA, debt financing in Europe is more important than stock-market financing (Sarens and Abdolmohammadi, 2011), which is also the case in Greece, the country of our sample. This implies that agency conflicts between creditors and owners-managers can prevail over agency conflicts between shareholders and management.

B. IA's role in CG (Model 2)

Our dependent variable is *IA_CG* that we presented in section IV, Part *C* and it is a binary variable. Therefore, we employed a binary logistic regression model to assess the effect of *IAF* quality on *CG* effectiveness (all model variables are defined in table 1, panel B):[13, 14, 15]

13. The dependent variable is a binary variable that takes the values 0 (negative outcome) or 1 (positive outcome). The categories of the dependent variable are independent since there is a clear distinction between the two outcomes (positive/negative). Moreover, non-continuous variables are mutually exclusive and exhaustive, since the model includes binary variables with clearly distinct outcomes. The conversion of *FREQ*, *IA_SIZE* and *ACADEMIC* to binary variables was made with dichotomization based on the sample median (Prawitt et al., 2009; Mat Zain et al., 2015). Every company with an outcome below the sample median took the value 0 in the corresponding variable and every company with an outcome above the sample median took the value 1.

14. The linearity of the continuous variables with respect to the logarithm of the dependent variable was assessed with the Box-Tidwell (1962) process, where all independent variables were found to be linearly associated with the logarithm of the dependent variable.

15. There is no multicollinearity problem in the data, since all tolerance values are greater than 0.1 and all Variance Inflation Factor Values are smaller than 10.

TABLE 1. Variable definitions. This table provides analytical definitions for dependent and independent variables in model 1 (panel A) and model 2 (panel B)

A. Model 1 - Internal audit function quality

Variable	Definition and measurement	Data source
IAFQ	a composite index that measures *IAF* quality and incorporates nine *IA* characteristics: independence; management's response to *IA*; *IA* manual; risk-based audit program; *IA* size; internal auditors' experience, education, training and professional certifications. *IAFQ* is the sum of the nine binary variables and its values range from 0 to 9, 0 reflecting the lowest level of quality and 9 the highest.	Survey
CG factors		
BoD_SIZE	the number of *BoD* members.	Annual report
BoD_INDEP	ratio of independent *BoD* members to the total number of *BoD* members.	Annual report
BoD_CHAIR	*BoD* chairman independence (1=independent; 0=not independent).	Annual report
AC_INDEP	independent members of the audit committee (1=majority is independent; 0=minority is independent).	Annual report
ACknowledge	there is at least one independent member of the audit committee with accounting and auditing knowledge (1=yes; 0=no).	Annual report /survey
ACmeetings	number of audit committee meetings per year.	Annual report
IApresence	ratio of audit committee meetings with the participation of *IA* to the total number of meetings per year.	Survey
OUT_FUNDS	foreign investment funds in shareholder ownership (1=yes; 0=no).	Survey
Control variables		
FIRM_SIZE (1)	natural logarithm of the number of the company's employees.	Annual report
*BIG*4	the company's external auditor is one of the Big 4 audit firms (1=yes; 0=no).	Annual report
REC_INV	ratio of accounts receivable and inventory to total assets.	Annual report
LEV	ratio of liabilities to equity.	Annual report

(*Continued*)

TABLE 1. (Continued)

B. Model 2 - *IA*'s role in *CG*

Variable	Definition and measurement	Data source
IA_CG	*IA*'s active role in *CG*. A binary variable that equals one if company's total score in eight *CG* processes is greater than the sample median, 0 otherwise.	Survey
IAF quality factors		
FRL	level to which *IAF* functionally reports (1=audit committee; 0=otherwise).	Survey
FREQ	frequency of management's response to *IA*'s findings and recommendations (1=value above sample median; 0=otherwise).	Survey
IA_SIZE	ratio of internal auditors to the total number of the company's employees (1=value above sample median; 0=otherwise).	Survey
EXP	average experience of internal auditors (1=value is greater than 7 years; 0=otherwise).	Survey
ACADEMIC	average number of auditors' years in undergraduate and graduate education (1=value above sample median; 0=otherwise).	Survey
TRAINING_HRS	average number of training hours per internal auditor, on a yearly basis.	Survey
CERT_Ratio	ratio of internal auditors with audit certification to the total number of a company's internal auditors.	Survey
Control variables		
SCOPE	range of a company's activities (1=international; 0=domestic).	Annual report
FIRM_SIZE (1)	natural logarithm of the number of the company's employees.	Annual report
CEO_Duality	*CEO* and chairman of the *BoD* are the same person (1=yes; 0=no).	Annual report
LEV	ratio of liabilities to equity.	Annual report
IApresence	ratio of audit committee meetings with the participation of *IA* to the total number of meetings per year.	Survey

Note: (1) We employed a logarithmic transformation to improve the reliability of this measure and reduce collinearity and outlier problems in statistical analysis (Mat Zain et al., 2006; Sarens, 2007; Arena and Azzone, 2009).

$$IA\_CG = \beta_0 + \beta_1 FRL + \beta_2 FREQ + \beta_3 IA\_SIZE + \beta_4 EXP$$

$$+ \beta_5 ACADEMIC + \beta_6 TRAINING\_HRS$$

$$+ \beta_7 CERT\_Ratio + \beta_8 SCOPE + \beta_9 FIRM\_SIZE$$

$$+ \beta_{10} CEO\_Duality + \beta_{11} LEV + \beta_{12} IApresense, \qquad (2)$$

The model combines *IAF* quality factors (predictor variables) with company characteristics (control variables). Predictor variables test our argument as outlined in section IV, Part *D*; the predictor variables that were employed in testing H8 (auditor competence) were *EXP*, *ACADEMIC*, *TRAINING_HRS* and *CERT_Ratio*. Control variables are based on the literature and involve factors than can potentially affect *IA*'s active role in *CG*. Two out of five control variables (*FIRM_SIZE* and *LEV*) have been discussed in section V, Part *A*. With respect to the range of a company's activities (*SCOPE*), Sarens et al. (2012) have argued that companies with international activities are exposed to international competition, face increased risks due to their participation in international markets and hence need to adopt best practices and monitoring mechanisms. In this framework, internationalized companies are expected to exhibit an active *IA* role in *CG*.

CEO_Duality is the variable that we employed to explore the effect of *CEO* and chairman of the *BoD* being the same person on *IA*'s role in *CG*. The separation of the role of the chairman of the *BoD* from that of the *CEO* is an essential issue in *CG* and it is explicitly addressed in many relevant guidelines and best practices (KING, 2009; ICGN, 2014; OECD, 2015). *CEO* duality matters because, among other things, it weakens the role of the chairman in monitoring the management, since the chairman is also an executive with access to information that is not available to other members of the *BoD*. Therefore, we expect that in companies with *CEO* duality increased monitoring is required and, consequently, a more active role for *IA* in *CG* is anticipated. Finally, prior research (Arena and Azzone, 2009) has identified an association between *IA*'s presence in the meetings of the audit committee (*IApresence*) and *IA* effectiveness. Hence this variable may affect *IA*'s role in *CG*. This variable was measured with the percentage of audit committee meetings where *IA* participated, on a yearly basis (Paape et al., 2003).

VI. Empirical analysis

A. Descriptive statistics

Internal audit function quality (Model 1)

Table 2, panel A presents descriptive statistics on the dependent variable (*IAFQ*) and all independent variables in the model, predictor and control ones. The *IAFQ* has an average value of 5.27 (greater than 4.5 which is the mean of the index range), which is a better outcome in comparison with other studies where the average was below the mean of the index range.[16] With respect to predictor variables, evidence on *IApresence* shows that *IA* is present in 78% of audit committee meetings on average. This result corroborates findings in Paape et al. (2003) who explored *IA* in Europe and found that, while in most countries *IA* participation in audit committee meetings was 100%, participation in Greece and France was 70%. This shows that no essential improvement was achieved in this area over the last fifteen years.

The average number of audit committee meetings (*ACmeetings*) is 4.73 per year, which is very close to the four meetings that is prescribed by the Greek *CG* code (HCGC, 2013). 71.1% of the respondents stated that the audit committee does not meet more than four times per year and 57.8% stated that the committee meets exactly four times. The fact that the high percentage of those which comply with the law is accompanied by a low percentage of those which exceed legal requirements (28.9%) might create concerns on actual (as opposed to formal) implementation of regulation. Moreover, a 0.33 average value for *BoD_CHAIR* shows that most participants (67%) do not comply with *CG* guidelines.

IA's role in CG (Model 2)

Table 2, panel B presents descriptive statistics on the dependent variable (*IA_CG*) and all independent variables in the model, predictor and control ones. The average value of our binary dependent variable (*IA_CG*) is 0.62 (1 corresponding to positive outcome), which means

16. Prawitt et al. (2009): average 2.33 in an index that ranged from 0 to 5; Johl et al. (2013): average 2.59 in an index that ranged from 0 to 6; Mat Zain et al. (2015): average 4, in an index that ranged from 0 to 9.

TABLE 2. Descriptive statistics. This table presents analytical descriptive statistics for our dependent variable, predictor variables and all control variables used in the analysis of model 1 (panel A) and model 2 (panel B).

A. Model 1 - Internal audit function quality							
Variables	Mean	S.D.	Minimum	Q1	Median	Q3	Maximum
Dependent variable							
IAFQ	5.27	1.530	2.000	4.000	5.00	6.00	8.00
Independent variables							
Predictor variables							
BoD_SIZE	8.44	2.580	5.000	6.000	8.00	10.50	15.00
BoD_INDEP	0.30	0.135	0.000	0.220	0.28	0.39	0.60
BoD_CHAIR	0.33	0.477	0.000	0.000	0.00	1.00	1.00
AC_INDEP	0.78	0.420	0.000	1.000	1.00	1.00	1.00
ACknowledge	0.93	0.252	0.000	1.000	1.00	1.00	1.00
ACmeetings	4.73	2.910	0.000	4.000	4.00	5.00	16.00
IApresence	0.78	0.380	0.000	0.530	1.00	1.00	1.00
OUT_FUNDS	0.51	0.506	0.000	0.000	1.00	1.00	1.00
Control variables							
FIRM_SIZE	5.81	1.850	1.790	4.600	5.55	7.24	9.85
*BIG*4	0.38	0.490	0.000	0.000	0.00	1.00	1.00
REC_INV	0.26	0.200	0.002	0.085	0.24	0.40	0.72
LEV	1.13	2.800	–9.280	0.270	0.78	1.72	9.90
B. Model 2 - *IA*'s role in *CG*							
Dependent variable							
IA_CG	0.62	0.490	0.00	0.00	1.00	1.00	1.00
Independent variables							
Predictor variables							
FRL	0.64	0.480	0.00	0.00	1.00	1.00	1.00
FREQ	0.67	0.480	0.00	0.00	1.00	1.00	1.00
IA_SIZE	0.27	0.450	0.00	0.00	0.00	1.00	1.00
EXP	0.62	0.490	0.00	0.00	1.00	1.00	1.00
ACADEMIC	0.51	0.500	0.00	0.00	1.00	1.00	1.00
TRAINING_HRS	30.42	24.290	0.00	10.00	30.00	40.00	100.00
CERT_Ratio	0.48	0.435	0.00	0.00	0.50	1.00	1.00
Control variables							
SCOPE	0.64	0.484	0.00	0.00	1.00	1.00	1.00
FIRM_SIZE	5.81	1.850	1.79	4.60	5.55	7.24	9.85
CEO_Duality	0.40	0.495	0.00	0.00	0.00	1.00	1.00
LEV	1.13	2.800	–9.28	0.27	0.78	1.72	9.90
IApresence	0.78	0.380	0.00	0.53	1.00	1.00	1.00

(*Continued*)

TABLE 2. (Continued)

Note: Panel A variable definitions: *IAFQ*: *IAF* quality, *BoD_SIZE*: number of *BoD* members, *BoD_INDEP*: ratio of independent board members, *BoD_CHAIR*: *BoD* chairman independence, *AC_INDEP*: independent members of the audit committee, *ACknowledge*: audit committee accounting and auditing knowledge, *ACmeetings*: number of Audit Committee meetings on a yearly basis, *IApresence*: *IA* participation in audit committee meetings, *OUT_FUNDS*: foreign investment funds, *FIRM_SIZE*: natural logarithm of the number of employees, *BIG*4: the company's external auditor is one of the Big 4 audit firms, *REC_INV*: ratio of accounts receivable and inventory to total assets, *LEV*: ratio of total liabilities to equity; Panel B variable definitions: *IA_CG*: *IA*'s active role in *CG*, *FRL*: level to which *IAF* reports, *FREQ*: frequency of management's response to *IA*'s findings, *IA_SIZE*: size of the *IAF*, *EXP*: internal auditors' experience, *ACADEMIC*: internal auditors' academic education, *TRAINING_HRS*: internal auditors' training, *CERT_Ratio*: internal auditors' professional certifications, *SCOPE*: range of a company's activities, *FIRM_SIZE*: natural logarithm of the number of the company's employees, *CEO_Duality*: *CEO* and chairman of the *BoD* are the same person, *LEV*: ratio of total liabilities to equity. *IApresence*: *IA* participation in audit committee meetings.

that *IA* has an active role in *CG* in 62% of the companies in the sample. Furthermore, the average score for the composite measure on *IA* contribution to *CG* is 19.87, a value which is smaller than the mean of the index range that is 20 (minimum 8 and maximum 32). Our findings corroborate international evidence; Marino et al. (2017) found an average of 18 in a similar index.

Our findings on the percentage of companies in which *IA* reports to the audit committee (*FRL*) (64%) are also similar to international evidence; Prawitt et al. (2009) came up with 69%. Furthermore, this finding is improved in comparison with 2003, when evidence from Greek companies indicated that *IA* refers to the *CEO* (Paape et al., 2003). With respect to management's response to *IA* (*FREQ*), it seems that response is complete in 67% of the cases, whereas in the joint assessment of the two variables (*FRL* and *FREQ*) we see that when *IA* reports to the audit committee, management's response is better. Since most companies do not employ many internal auditors (partly because they are not particularly large themselves), the ratio of internal auditors to the total number of employees (*IA_SIZE*) is often used to interpret the results in similar studies. Ideally, there should be one internal auditor per 100 employees (Regoliosi and d'Eri, 2014). The results are not particularly encouraging in this respect: only one in three companies meet the 1% criterion for the optimal percentage of internal auditors over total employees.

Taking a close look at data on internal auditors' competence,[17] we see that: (a) 38% of the companies stated that the average length of internal auditors' experience is less than 7 years (*EXP*), (b) 50.3% of internal auditors state that their education does not include postgraduate studies, 44.5% hold a master's degree and 5.2% hold a doctorate diploma, (c) the average number of training hours per year is 30.42 hours for the internal auditors in our sample (*TRAINING_HRS*), and d) in 33.3% of the companies there is no internal auditor with professional certification in auditing, while 52% of certified auditors hold CIA (Certified Internal Auditor) certification, which shows that it is the most widely used certification in *IA*. The percentage of internal auditors that hold professional certification is rather low (30%), which is in accordance with the findings of previous research on the Athens Stock Exchange in 2006 (Koutoupis, 2006). Therefore, professionalization is stable and low in Greece, in contrast to international evidence where the percentage of internal auditors with professional certification reaches 58% (Prawitt et al., 2009). Finally, *CEO* duality occurs in 40% of the sample, which is similar to European evidence. E.g., Regoliosi and d'Eri (2014) report *CEO* duality at 47% of Italian companies in their sample.

B. Correlation evidence

Internal audit function quality (Model 1)

Table 3, panel A presents the correlation matrix for all variables of the model. Correlation evidence corroborates many of our theoretical arguments. Namely, *IAF* quality is significantly positively correlated with the independent members of the *BoD* (*BoD_INDEP*), audit committee's accounting and auditing knowledge (*ACknowledge*), *IA* presence in audit committee meetings (*IApresence*) and shareholder ownership by investment funds (*OUT_FUNDS*). Furthermore, we observe significant correlation between *IAF* quality with the status of the external auditor (*BIG*4). Apart from correlations with the dependent variable, table 3 shows that there is significant correlation between some independent variables. *BoD* chairman independence (*BoD_CHAIR*) is correlated with many variables and so is shareholder

17. Here we present summary statistics on variables in their initial format. Subsequent analysis of similar variables is based, in part, in transforming initial data to construct the variables of interest in the context of our empirical work.

ownership (*OUT_FUNDS*), company size (*FIRM_SIZE*) and two variables that refer to the audit committee (*ACmeetings* & *IApresense*). Despite significant correlations between some independent variables, our data set does not exhibit multicollinearity problems; only one correlation is greater than 0.5 (*FIRM_SIZE* vs *BOD_SIZE*) and in this case the Variance Inflation Factor is smaller than 10.

IA's role in CG (Model 2)

Table 3, panel B presents the correlation matrix for all variables of the model. Overall, there is limited evidence of correlation between the variables. Namely, correlation evidence seems to support only the hypothesis of a positive association between *IA*'s active role in *CG* and the size of *IAF* (*IA_SIZE*). *IA*'s role in *CG* is also significantly correlated with the range of company activities (*SCOPE*) and *CEO* duality. As far as the correlation between independent variables is concerned, the only significant result occurs between internal auditors' training (*TRAINING_HRS*) and *IA* participation in audit committee meetings (*IApresence*). Finally, only one correlation coefficient exceeds 0.5 between independent variables; the correlation between the size of the *IAF* (*IA_SIZE*) and the size of the company (*FIRM_SIZE*) is 0.693. However, this does not create a problem of multicollinearity since Variance Inflation Factor values are less than 10.

C. Regression results

Internal audit function quality (Model 1)

Table 4, panel A presents the results of ordinal logistic regression about the effects of *CG* factors on *IAF* quality. The model is significant at $p<0.001$, with a pseudo R^2 of 0.575 and some independent variables are significant at 0.05 and 0.10 levels of statistical significance. With respect to control variables, table 4 reveals a negative relationship between *IAF* quality and company size (*FIRM_SIZE*, $p<0.10$). We also observe that *IAF* quality is higher when the external auditor is one of the Big 4 audit firms (*BIG*4, $p<0.05$).

With respect to predictor variables, our regression analysis corroborates our hypotheses, since it provides support for H1 (*BoD_INDEP*), H2 (*ACknowledge*), H3 (*IApresence*) and H4 (*OUT_FUND*). The results indicate a positive relationship between *BoD*

TABLE 3. Pearson correlation coefficients for all variables used in our analysis (Model 1: panel A and Model 2: panel B)

A. Model 1 - Internal audit function quality

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 *IAFQ*	1.00												
2 *BoD_SIZE*	0.10	1.00											
3 *BoD_INDEP*	0.45***	–0.19	1.00										
4 *BoD_CHAIR*	–0.16	–0.21	–0.26*	1.00									
5 *AC_INDEP*	–0.09	0.07	–0.30**	0.15	1.00								
6 *ACknowledge*	–0.28*	–0.19	–0.11	0.00	0.29*	1.00							
7 *ACmeetings*	0.17	0.05	0.13	–0.36**	0.01	–0.19	1.00						
8 *IApresence*	0.52***	0.20	0.29*	–0.27*	–0.19	–0.20	0.34**	1.00					
9 *OUT_FUNDS*	–0.41***	–0.20	–0.20	0.31**	0.01	0.27*	–0.31**	–0.28*	1.00				
10 *FIRM_SIZE*	–0.01	0.60***	–0.14	–0.27*	0.33**	–0.13	0.38**	0.17	–0.26*	1.00			
11 *BIG4*	–0.47***	–0.24	–0.20	0.13	–0.02	0.02	–0.12	–0.33**	0.12	–0.20	1.00		
12 *REC_INV*	–0.07	–0.28*	0.13	0.14	–0.19	–0.16	–0.01	0.01	0.05	–0.22	0.39***	1.00	
13 *LEV*	–0.04	–0.18	0.11	–0.03	–0.14	–0.05	0.32**	0.01	–0.04	–0.03	0.35**	0.20	1.00

(*Continued*)

TABLE 3. (Continued)

B. Model 2 - *IA*'s role in *CG*

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 *IA_CG*	1.00												
2 *FRL*	–0.20	1.00											
3 *FREQ*	–0.06	0.16	1.00										
4 *IA_SIZE*	0.26*	–0.18	0.00	1.00									
5 *EXP*	–0.04	–0.00	0.23	–0.15	1.00								
6 *ACADEMIC*	–0.03	0.11	0.16	0.09	0.06	1.00							
7 *TRAINING_HRS*	0.21	0.27*	0.26*	–0.22	0.17	–0.08	1.00						
8 *CERT_Ratio*	0.05	–0.01	–0.09	–0.20	0.23	0.11	0.17	1.00					
9 *SCOPE*	0.28*	–0.07	–0.23	–0.18	–0.00	–0.08	0.08	0.04	1.00				
10 *FIRM_SIZE*	–0.01	0.23	–0.06	–0.69***	0.11	–0.05	0.14	0.04	0.18	1.00			
11 *CEO_Duality*	–0.30**	0.04	–0.19	0.12	–0.11	0.16	–0.37**	–0.10	–0.15	–0.05	1.00		
12 *LEV*	0.12	0.17	–0.01	0.15	0.07	–0.16	0.01	0.01	0.13	–0.03	–0.11	1.00	
13 *IApresence*	–0.12	0.43***	0.41***	–0.12	0.03	0.21	0.36**	–0.03	0.05	0.17	–0.16	0.01	1.00

Note: ***, **, * Correlation is significant at the 0.01, 0.05 and 0.10 level respectively (two tailed); Panel A variable definitions: *IAFQ*: *IAF* quality, *BoD_SIZE*: number of *BoD* members, *BoD_INDEP*: ratio of independent board members, *BoD_CHAIR*: *BoD* chairman independence, *AC_INDEP*: independent members of the audit committee, *ACknowledge*: audit committee accounting and auditing knowledge, *ACmeetings*: number of Audit Committee meetings on a yearly basis, *IApresence*: *IA* participation in audit committee meetings, *OUT_FUNDS*: foreign investment funds, *FIRM_SIZE*: natural logarithm of the number of employees, *BIG*4: the company's external auditor is one of the Big 4 audit firms, *REC_INV*: ratio of accounts receivable and inventory to total assets, *LEV*: ratio of total liabilities to equity; Panel B variable definitions: *IA_CG*: *IA*'s active role in *CG*, *FRL*: level to which *IAF* reports, *FREQ*: frequency of management's response to *IA*'s findings, *IA_SIZE*: size of the *IAF*, *EXP*: internal auditors' experience, *ACADEMIC*: internal auditors' academic education, *TRAINING_HRS*: internal auditors' training, *CERT_Ratio*: internal auditors' professional certifications, *SCOPE*: range of a company's activities, *FIRM_SIZE*: natural logarithm of the number of the company's employees, *CEO_Duality*: *CEO* and chairman of the *BoD* are the same person, *LEV*: ratio of total liabilities to equity. *IApresence*: *IA* participation in audit committee meetings.

independence (*BoD_INDEP*) and *IAF* quality at a 10% level of significance. These results are in contrast with evidence in the literature, which indicated that *BoD* independence bears a negative impact on the size of *IAF* (Sarens and Abdolmohammadi, 2011) and no impact at all on a company's decision to have an *IAF* (Goodwin-Steward and Kent, 2006).

Furthermore, we observe that *IAF* quality increases when at least one of the members of the audit committee has accounting and auditing knowledge (*ACknowledge*, $p<0.05$). This finding is in accordance with the results of Mat Zain et al. (2006), while it is in contrast with Goodwin-Steward and Kent (2006) who discovered a negative impact, which they attributed to the possible substitution of *IA* by experienced members of the audit committee. Moreover, we found a positive relationship between *IAF* quality and the participation of *IA* in the meetings of the audit committee (*IApresence*, $p<0.05$), corroborating prior studies (Arena and Azzone, 2009).

Finally, we found a significant effect of investment fund ownership (*OUT_FUND*) on *IAF* quality ($p<0.05$); Regoliosi and d'Eri (2014) also discovered a significant relationship, but it was a negative one. Overall, our findings indicate that *IAF* quality is affected by *CG* compliance. Nevertheless, it seems that "good" *CG*, in terms of compliance, does not always reflect a "good" *IAF* in terms of quality (Regoliosi and d'Eri, 2014), since we did not come up with significant results (on *IAF* quality) for some factors that reflect compliance with *CG*, such as the independence of the chairman of the *BoD* and the meetings of the audit committee.

We performed three more tests, in which we added and removed several variables, to check the model's robustness. First, we removed the correlated variables one by one and ran the regression repeatedly to explore the effect of each variable on the significance of the other variables of the model. The results produced small differences in coefficient values and confidence intervals but no change on statistical significance. Then we performed the same procedure on control variables and reached similar results.

The second robustness check involves *IA* outsourcing. Mat Zain et al. (2006), in a study on the contribution of *IA* to external audit, excluded the companies that had outsourced all *IA* processes. However, in this paper we chose to include the companies that have outsourced part of (or all) their *IAF*, since the answer to our research question does not depend on *IA* outsourcing but also because *IA* outsourcing is an

integral part of *IA* in Greece. 15.6% of the companies in the sample have outsourced *IA*, whereas 42.8% of them has outsourced 100% of *IAF*. To explore the effect of outsourcing we ran our model incorporating a binary variable (*IA_OUT*) which took the value 0 if *IA* was outsourced and 1 otherwise (Arena and Azzone, 2009). The regression results showed that outsourcing does not affect the statistical significance of the variables, it only causes small changes in coefficient values.

Finally, we ran our model by replacing the variable *FIRM_SIZE* (total employees of the company) with *FIRM_SIZE_2* (total assets of the company) (e.g., Regoliosi and d'Eri, 2014; Mat Zain et al., 2015). The regression results produced no change on statistical significance. The results of all the above robustness checks are presented in appendix B, panel A.

IA's role in CG (Model 2)

Table 4, panel B presents the results of binary logistic regression about the effects of quality characteristics of *IAF* on *IA*'s active role in *CG*. The model has significant explanatory power (86.7% classification accuracy and a pseudo R^2 of 61%) and some independent variables are significant at 0.01, 0.05 and 0.10 levels of statistical significance.[18] The results in table 4 provide support for H7 (*IAF* size) and partially for H8 (internal auditors' training). With respect to the predictor variables, we find that only two (out of six) exert a statistically significant impact on *IA*'s active role in *CG* (*IA_SIZE* and *TRAINING*, $p<0.05$). Those results are expected and consistent with prior research. *IAF* size has been found to have a positive impact on the quality of financial statements and *IA* effectiveness (Mat Zain et al., 2006; Johl et al., 2013; Pizzini et al., 2015; Arena and Azzone, 2009; Alzeban and Gwilliam, 2014). Likewise, internal auditors' training is a competence factor that has been linked to the quality of financial statements and *IA* effectiveness (Prawitt et al., 2009; Pizzini et al., 2015; Alzeban and Gwilliam, 2014).

Contrary to predictor variables, the logistic regression analysis yielded significant results for four out of five control variables. Namely, the probability of *IA* having an active role in *CG* is significantly higher for companies with international business activities (*SCOPE*, $p<0.10$), a result that was anticipated by our theoretical framework. Moreover,

18. These are the significance levels that have been employed in previous studies (Prawitt et al., 2009; Lin et al., 2011).

TABLE 4. Regression results. This table presents the results from logistic regressions linking *CG* factors and control variables with the *IAF* quality (Model 1) and *IAF* quality factors and control variables with *IA*'s role in *CG* (Model 2)

A. Model 1 - Internal audit function quality

			Hypothesis Test	
Variables	Expected sign.	B	Wald	Significant
BoD_SIZE	+	0.052	0.116	0.733
BoD_INDEP	+	4.791	3.432	0.064*
BoD_CHAIR	+	–0.123	0.029	0.864
AC_INDEP	+	–1.150	1.888	0.169
ACknowledge	+	3.396	5.702	0.017**
ACmeetings	+	–0.047	0.133	0.715
IApresence	+	2.197	5.375	0.020**
OUT_FUNDS	+/–	1.499	4.971	0.026**
FIRM_SIZE		–0.459	3.681	0.055*
*BIG*4		1.693	4.743	0.029**
REC_INV		–0.245	0.022	0.883
LEV		0.068	0.323	0.570
LR $chi^2 = 36.804$				
Prob>$chi^2 = 0.000$				
Pseudo $R^2 = 0.575$ (Nagelkerke) & 0,228 (McFadden)				

B. Model 2 - *IA*'s role in *CG*

FRL	+	–1.472	1.388	0.239
FREQ	+	0.718	0.278	0.598
IA_SIZE	+	5.602	7.589	0.006***
EXP	+	–1.406	1.410	0.235
ACADEMIC	+	0.711	0.479	0.489
TRAINING_HRS	+	0.046	3.967	0.046**
CERT_Ratio	+	0.908	0.460	0.498
SCOPE		2.123	3.587	0.058*
FIRM_SIZE		0.904	4.403	0.036**
CEO_Duality		–2.271	3.683	0.055*
LEV		0.080	0.079	0.779
IApresence		–3.606	2.718	0.099*
Constant		–4.222	1.694	0.193
$\chi^2 = 26.730$ ($p<0.01$)***				
Classification accuracy = 86.7%				
Nagelkerke (pseudo) $R^2 = 0.61$				

(*Continued*)

TABLE 4. (Continued)

Note: ***, **, * indicate statistical significance at the *p*-value ≤ 0.01, 0.05 and 0.10 levels respectively; Panel A variable definitions: *BoD_SIZE*: number of *BoD* members, *BoD_INDEP*: ratio of independent board members, *BoD_CHAIR*: *BoD* chairman independence, *AC_INDEP*: independent members of the audit committee, *ACknowledge*: audit committee accounting and auditing knowledge, *ACmeetings*: number of Audit Committee meetings on a yearly basis, *IApresence*: *IA* participation in audit committee meetings, *OUT_FUNDS*: foreign investment funds, *FIRM_SIZE*: natural logarithm of the number of employees, *BIG*4: the company's external auditor is one of the Big 4 audit firms, *REC_INV*: ratio of accounts receivable and inventory to total assets, *LEV*: ratio of total liabilities to equity; Panel B variable definitions: *FRL*: level to which *IAF* reports, *FREQ*: frequency of management's response to *IA*'s findings, *IA_SIZE*: size of the *IAF*, *EXP*: internal auditors' experience, *ACADEMIC*: internal auditors' academic education, *TRAINING_HRS*: internal auditors' training, *CERT_Ratio*: internal auditors' professional certifications, *SCOPE*: range of a company's activities, *FIRM_SIZE*: natural logarithm of the number of the company's employees, *CEO_Duality*: *CEO* and chairman of the *BoD* are the same person, *LEV*: ratio of total liabilities to equity. *IApresence*: *IA* participation in audit committee meetings.

we found that *IA*'s active role in *CG* is positively associated with company size (*FIRM_SIZE*, $p<0.05$), corroborating previous findings in the literature (Sarens et al., 2012; Mat Zain et al., 2015). Furthermore, the regression results suggest that *IA* having an active role in *CG* is significantly less likely when the chairman of the *BoD* is also the company's *CEO* (*CEO_Duality*, $p<0.10$). This is consistent with Goodwin-Steward and Kent (2006) who concluded that *CEO* duality adversely affects the existence of an *IAF* and Vadasi et al. (2019) who found that internal audit's contribution to corporate governance is negatively associated with *CEO* duality. Finally, contrary to our expectations, we find that the chance for *IAF* to have an active role in *CG* is significantly negatively associated with *IA* presence in audit committee meetings (*IApresence*, $p<0.10$). This finding contradicts evidence in prior research, which concluded that the participation of *IA* in the meetings of the audit committee has a positive effect on *IA* effectiveness (Arena and Azzone, 2009).

Overall, the results of the logistic regression indicate that there is a weak connection between *IA*'s active role in *CG* and *IAF* quality, since we did not come up with significant results for many factors that determine *IAF* quality, such as independence, management's response, experience, level of education, and professional certifications.[19]

19. For some of these factors (*FRL* and *FREQ*) insignificant results may be due to the lack of large variations in the sample (Pizzini et al., 2015).

We performed three more tests, to assess the model's robustness. First, we ran the regression having removed the correlated variables one by one. We also tried running the regression and removing the control variables one by one. These tests did not produce different outcomes in terms of significance or sign. The second robustness check involves *IA* outsourcing. We modeled *IA* outsourcing with a binary variable (*IA_OUT*) that takes the value 0 if *IA* is outsourced and 1 otherwise (Arena and Azzone, 2009; Johl et al., 2013). This test did not yield different results on the sign or the significance of the coefficients. Finally, we ran our model by replacing the variable *FIRM_SIZE* (total employees of the company) with *FIRM_SIZE_*2 (total assets of the company) (e.g., Regoliosi and d'Eri, 2014; Mat Zain et al., 2015).[20] The regression results produced some changes with respect to the primary results. In this model specification, the effect of firm size on *IA*'s active role in *CG* is no longer corroborated. This is probably due to the fact the *IA_SIZE* variable refers to the ratio of international auditors to the total number of firm employees. Therefore, when firm size is measured with the number of employees *IA_SIZE* appears to affect *IA* effectiveness (Sarens et al., 2012), whereas it appears to be insignificant when firm size is measured with total assets. The results of these robustness tests are presented in appendix B, panel B.

VII. Conclusion

In this paper we explored two aspects of the relationship between internal audit function (*IAF*) and corporate governance (*CG*). The first aspect involves the effect of "good" *CG* on *IAF* quality, whereas the second aspect involves the effect of *IAF* quality on *CG* effectiveness. Our findings on 45 listed companies in the Athens Stock Exchange suggest that *CG* compliance bears a substantial impact on *IAF* quality, but *IAF* quality does not significantly affect *CG* effectiveness. While *IA* is affected by the proper implementation of *CG* guidelines in the company, internal audit (*IA*) cannot influence *CG* quality, even though it is one of four cornerstones of *CG*. Namely, our statistical results showed that "good" *IAF* (in terms of quality) does not necessarily

20. The linearity of the continuous variable *FIRM_SIZE_*2 with respect to the logarithm of the dependent variable was assessed with the Box-Tidwell (1962) process we found that the independent variable is linearly associated with the logarithm of the dependent variable.

reflect "good" *CG*, in terms of an effective impact of *IA* on *CG* processes. This finding is in contrast with evidence in prior research, which suggests that *IAF* quality is associated with other factors that proxy *IA*'s active role in *CG*, such as *IA* effectiveness (Mihret and Yismaw, 2007) and the quality of financial statements through earnings manipulation (Prawitt et al., 2009; Johl et al., 2013), audit delays (Pizzini et al., 2015) and audit fees (Mat Zain et al., 2015). The difference in our results may be due to the fact that we explored the effect of *IAF* quality on a wide range of *CG* processes, while previous studies analyzed the effect of *IAF* on more specific issues, such as the quality of financial statements.

Interestingly, while *IAF* quality has limited impact on *IA*'s active role in *CG*, several other company characteristics bear substantial impact on *IA*'s active role in *CG* (e.g., internationalization and *CEO* duality). This implies that *IAF* is not substantially present in the company and, consequently, other factors are more important in shaping *CG*. Moreover, it seems that *IA* itself is a follower even in decisions that affect its function, a conclusion that has also been reached by many CAEs who participated in the research. CAEs also argued that *IA* processes are often shaped by the management and these processes sometimes address matters that are external to *IA*.

Our findings constitute a contribution to the *IA* literature, since *IAF*, as a *CG* mechanism, has attracted limited academic attention in the context of a bidirectional analysis and there has been no prior study on this issue about Greek companies. Furthermore, the examination of publicly available *CG* data and non-public *IA* data allows us to better understand the effect of *CG* on a fundamental part of a company's operations such as *IA*. The results of this study are useful for many stakeholders. CAEs and internal auditors are the first who can make use of the findings of this paper to improve their work.

Apart from *IA* professionals, this study is useful to many other stakeholders. Inside the company, the *BoD*, the audit committee and the management can employ our findings to reorient their approach to *IA*. To improve *IA* effectiveness, they must understand the benefits from *IA* implementation and proceed to necessary initiatives, such as hiring specialized professionals for *IAF*, choosing a CAE who is specialized in *IA*, facilitating *IAF* and responding to its findings.

With respect to external stakeholders, external auditors can benefit from the findings of this study since they work closely with *IA* and, therefore, a better understanding of the relationship between *IA* and *CG*

can shape external audit's collaboration with *IA*. Moreover, shareholders and creditors who can access only publicly available information, can make use of this study's findings to understand the determinants of *IA* through the analysis of the relationship between *IA* and *CG*. Finally, our findings are useful to regulators and standard-setting organizations. These organizations can make use of our findings to set the rules that will lead to more effective implementation for *IA* and *CG*.

The source of our empirical research constitutes a limitation of this study. While CAE's can provide adequate and specialized information, they are also likely to provide biased responses since they are asked to assess their personal competency and the efficiency of their work. To mitigate this limitation, a lot of our questions were asked in a manner that restraints the possibility of subjective answers. Moreover, wherever we had a choice between assessing an individual's perception and measuring a variable, we opted for the latter. Another limitation has to do with the fact that our data comes from a sample of Greek companies that operate in an environment with particular social and economic characteristics, which probably restricts the possibility of generalizing our findings and policy implications to companies that operate in fundamentally different economies. The acknowledgement of this limitation is necessary to avoid cross-national inconsistencies which emerge when conducting this kind of research in a sample with many countries (Mat Zain et al., 2015).

This study discusses a relatively unexplored area, which, along with the paper's limitations, creates opportunities for future research. Our finding that *IAF* quality does not bear substantial impact on *IA*'s active role in *CG* was unexpected and deserves further investigation. The implementation of our approach in a different socio-economic environment will probably yield different results. Furthermore, it is interesting to expand this study to financial companies, in order to compare our findings and address some of the *IA* challenges in the credit system. It is also worth investigating our research question from the point of view of the other *CG* players, such as the audit committee, external audit, the *CEO* or another senior executive. Finally, future research can also explore the point of view of those stakeholders that are affected by *CG* processes, such as the investors, creditors and employees.

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Appendix A. Comparison of survey's early (*n*=23) and late (*n*=22) respondents for differences with a *t*-test for continuous variables (Panel A) and a chi-square test for categorical variables (Panel B)

A. Continuous Variables

Variables	Mean (Std Deviation) Early responses	Mean (Std Deviation) Late responses	*t*-test	*p*-value	Levene's test for equality of variances (sig.)	Test of normality Shapiro-Wilk (sig.) Early responses	Test of normality Shapiro-Wilk (sig.) Late responses	Mann-Whitney U non-parametric test (sig.) (2)
BoD_SIZE	8.390	8.500	–0.140	0.890	0.914	0.063	0.140	-
Model 1	(2.743)	(2.464)						
BoD_INDEP	0.307	0.297	0.250	0.804	0.128	0.226	0.287	-
Model 1	(0.160)	(0.105)						
ACmeetings	4.390	5.090	–0.801	0.428	0.469	0.000	0.000	0.411
Model 1	(2.726)	(3.131)						
IApresense	0.709	0.857	–1.327	0.192	0.012(1)	0.000	0.000	0.299
Model 1,2	(0.429)	(0.314)						
TRAINING_HRS	29.520	31.360	–0.252	0.803	0.361	0.011	0.009	0.954
Model 2	(22.569)	(26.457)						
CERT_Ratio	0.394	0.565	–1.320	0.194	0.691	0.000	0.000	0.148
Model 2	(0.425)	(0.439)						
FIRM_SIZE	5.845	5.774	0.128	0.899	0.598	0.888	0.427	-
Model 1,2	(1.952)	(1.775)						
REC_INV	0.246	0.268	–0.357	0.723	0.894	0.041	0.185	0.650
Model 1	(0.206)	(0.1932)						
LEV	0.988	1.284	–0.351	0.727	0.336	0.001	0.000	0.982
Model 1,2	(3.314)	(2.201)						

(*Continued*)

Appendix A. (Continued)

B. Categorical Variables

Variables	% negative result = 0 (count)		% positive result = 1 (count)		Chi-Square of homogeneity test (sig.)	Fisher's test (sig.)
	Early responses	Late responses	Early responses	Late responses		
BoD_CHAIR	56.5	77.3	43.5	22.7	0.140	-
Model 1	(13)	(17)	(10)	(5)		
AC_INDEP	30.4	13.6	69.6	86.4	-	0.284(3)
Model 1	(7)	(3)	(16)	(19)		
ACknowledge	8.7	4.5	91.3	95.5	-	0.517(3)
Model 1	(2)	(1)	(21)	(21)		
OUT_FUNDS	52.2	45.5	47.8	54.5	0.652	-
Model 1	(12)	(10)	(11)	(12)		
*BIG*4	65.2	59.1	34.8	40.9	0.672	-
Model 1	(15)	(13)	(8)	(9)		
FRL	30.4	40.9	69.6	59.1	0.463	-
Model 2	(7)	(9)	(16)	(13)		
FREQ	30.4	36.4	69.6	63.6	0.673	-
Model 2	(7)	(8)	(16)	(14)		
IA_SIZE	73.9	72.7	26.1	27.3	0.928	-
Model 2	(17)	(16)	(6)	(6)		
EXP	39.1	36.4	60.9	63.6	0.848	-
Model 2	(9)	(8)	(14)	(14)		

(*Continued*)

Appendix A. (Continued)

Variables	% negative result = 0 (count)		% positive result = 1 (count)		Chi-Square of homogeneity test (sig.)	Fisher's test (sig.)
	Early responses	Late responses	Early responses	Late responses		
ACADEMIA	47.8	50.0	52.2	50.0	0.884	-
Model 2	(11)	(11)	(12)	(11)		
SCOPE	39.1	31.8	60.9	68.2	0.608	-
Model 2	(9)	(7)	(14)	(15)		
CEODuality	60.9	59.1	39.1	40.9	0.909	-
Model 2	(14)	(13)	(9)	(9)		

Note: (1) The assumption of homogeneity of variables is violated for *IApresense*, therefore we report the results of Welch *t*-test at columns "*t*-test" and "*p*-value", because this modified *t*-test can accommodate unequal variances and still deliver a valid test result; (2) However, since for some variables the assumption of normality is violated, we run the independent-samples *t*-test because it is fairly robust to deviations from normality in sample sizes where the numbers in each group are equal, or nearly equal (early respondents=23, late respondents=22). To check for robustness, we run complementary a non-parametric test (Mann-Whitney U test) which is a popular alternative of the independent-samples *t*-test. The results confirmed that there were no statistically significantly differences between early and late respondents ($p > 0.05$); (3) Two of the categorical variables (*AC_INDEP* & *ACknowledge*) have cells with an expected count <5. Since an adequate sample size to run the chi-square test of homogeneity is a sample with all expected counts greater than or equal to 5, we conducted Fisher's exact test between early and late respondents and those two variables; Panel A variable definitions: *BoD_SIZE*: number of *BoD* members, *BoD_INDEP*: ratio of independent board members, *ACmeetings*: number of Audit Committee meetings on a yearly basis, *IApresence*: *IA* participation in audit committee meetings, *TRAINING_HRS*: internal auditors' training, *CERT_Ratio*: internal auditors' professional certifications, *FIRM_SIZE*: natural logarithm of the number of employees, *REC_INV*: ratio of accounts receivable and inventory to total assets, *LEV*: ratio of total liabilities to equity; Panel B variable definitions: *BoD_CHAIR*: *BoD* chairman independence, *AC_INDEP*: independent members of the audit committee, *ACknowledge*: audit committee accounting and auditing knowledge, *OUT_FUNDS*: foreign investment funds, *BIG*4: the company's external auditor is one of the Big 4 audit firms, *FRL*: level to which *IAF* reports, *FREQ*: frequency of management's response to *IA*'s findings, *IA_SIZE*: size of the *IAF*, *EXP*: internal auditors' experience, *ACADEMIC*: internal auditors' academic education, *SCOPE*: range of a company's activities, *CEO_Duality*: *CEO* and chairman of the *BoD* are the same person.

Appendix B. Robustness check

A. Model 1 - Internal audit function quality

Ordinal logistic regression. See equation (1).

	Regression 1 (without *ACmeeting*)		Regression 2 (without *BoD_CHAIR*)		Regression 3 (without *IApresence*)		Regression 4 (without *OUT_FUNDS*)		Regression 5 (without *FIRM_SIZE*)	
Variable	B	Wald	B	Wald	B	Wald	B	Wald	B	Wald
BoD_SIZE	0.068	0.215	0.048	0.098	0.105	0.481	0.064	0.177	0.096	0,574
BoD_INDEP	4.867	3.553*	4.719	3.527*	5.384	4.446**	5.130	4.077**	4.443	3,050*
BoD_CHAIR	–0.218	0.099	-	-	–0.058	0.0007	–0.216	0.094	–0.228	0,104
AC_INDEP	–1.122	1.800	–1.182	2.096	–0.927	1.273	–1.227	2.193	–0.492	0,421
ACknowledge	3.286	5.432**	3.482	6.148**	3.420	5.905**	3.786	7.460***	2.897	4,345**
ACmeetings	-	-	–0.053	0.186	–0.002	0.035	–0.006	0.002	–0.110	0,831
IApresence	2.135	5.250**	2.179	5.320**	-	-	2.110	5.092**	2.171	5,368**
OUT_FUNDS	1.458	4.806**	1.474	4.950**	1.457	4.861**	-	-	1.284	3,847**
FIRM_SIZE	–0.482	4.446**	–0.461	3.792*	–0.423	3.192*	–0.439	3.252*	-	-
BIG4	1.653	4.643**	1.703	4.867**	2.103	7.390***	1.636	4.547**	1.651	4,616**
REC_INV	–0.255	0.024	–0.241	0.021	–0.334	0.042	–0.485	0.087	–0.038	0,001
LEV	0.049	0.194	0.071	0.350	0.077	0.421	0.057	0.234	0.052	0,194
IA_OUT	-	-	-	-	-	-	-	-	-	-
FIRM_SIZE_2	-	-	-	-	-	-	-	-	-	-
LR chi^2	36.651		36.777		31.202		31.782		32.876	
Prob>chi^2	0.000		0.000		0.001		0.001		0.001	
Pseudo R^2	0.575 & 0.228		0.574 & 0.228		0.514 & 0.194		0.521 & 0.197		0.533 & 0.204	

(*Continued*)

Appendix B. (Continued)

Variable	Regression 6 (without *BIG*4)		Regression 7 (without *REC_INV*)		Regression 8 (without *LEV*)		Regression 9 (with *IA_OUT*)		Regression 10 (with assets as firm size mesure - *FIRM_SIZE_*2)	
	B	Wald	B	Wald	B	Wald	B	Wald	B	Wald
BoD_SIZE	0.066	0.187	0.056	0.134	0.043	0.078	0.63	0.168	0.116	0.625
BoD_INDEP	5.460	4.772**	4.748	3.452*	4.910	3.644*	5.529	4.383**	6.401	5.726**
BoD_CHAIR	–0.258	0.133	–0.121	0.029	–0.171	0.058	–0.130	0.032	–0.152	0.045
AC_INDEP	–1.087	1.706	–1.155	1.913	–1.055	1.623	–1.346	2.522	–1.072	1.853
ACknowledge	3.485	5.837**	3.351	5.693**	3.321	5.449**	3.564	6.226**	3.140	4.795**
ACmeetings	–0.14	0.12	–0.047	0.135	–0.19	0.025	–0.003	0.001	–0.032	0.057
IApresence	2.766	8.676***	2.181	5.411**	2.214	5.421**	1.931	4.028**	1.676	3.045*
OUT_FUNDS	1.448	4.802*	1.506	5.025**	1.478	4.852**	1.182	3.622*	1.689	5.915**
FIRM_SIZE	–0.441	3.490*	–0.457	3.649*	–0.449	3.554*	–0.469	3.833*	-	-
*BIG*4	-	-	1.731	5.651**	1.549	4.602**	1.679	4.566**	2.139	6.983***
REC_INV	–1.481	0.922	-	-	–0.277	0.028	–0.522	0.098	–0.611	0.132
LEV	0.027	0.060	0.069	0.328	-	-	0.040	0.105	0.156	1.538
IA_OUT	-	-	-	-	-	-	1.231	1.967	-	-
*FIRM_SIZE_*2	-	-	-	-	-	-	-	-	–0.810	7,745***
LR chi^2	31.556		36.783		36.482		38.753		4.458	
Prob>chi^2	0.001		0.000		0.000		0.000		0.000	
Pseudo R^2	0.518 & 0.196		0.574 & 0.228		0.571 & 0.226		0.594 & 0.240		0.619 & 0.257	

(*Continued*)

Appendix B. (Continued)

B. Model 2 - *IA*'s role in *CG*

Binary logistic regression. See equation (2).

	Regression 11 (without *TRAINING_HRS*)		Regression 12 (without *IApresence*)		Regression 13 (without *SCOPE*)		Regression 14 (without *FIRM_SIZE*)		Regression 15 (without *CEO_Duality*)	
Variable	B	Wald	B	Wald	B	Wald	B	Wald	B	Wald
FRL	–0.821	0.600	–1.918	2.677	–1.721	2.301	–0.971	0.899	–1.246	1.506
FREQ	0.741	0.347	0.429	0.143	0.283	0.067	0.270	0.064	0.604	0.279
IA_SIZE	4.816	7.329***	5.238	6.874***	4.556	6.777***	2.859	5.028**	4.724	7.174***
EXP	–0.905	0.765	–1.074	0.787	–1.123	1.235	–0.690	0.532	–0.622	0.445
ACADEMIC	0.337	0.140	0.062	0.005	0.806	0.614	0.748	0.625	0.355	0.150
TRAINING_HRS	-	-	0.035	2.762*	0.046	4.015**	0.041	3.529*	0.054	5.595**
CERT_Ratio	1.246	1.027	1.043	0.717	0.664	0.289	0.202	0.036	0.674	0.413
SCOPE	1.970	3.942**	1.631	2.961*	-	-	1.559	2.742*	2.157	4.224**
FIRM_SIZE	0.779	4.270**	0.855	3.725*	0.704	3.723*	-	-	0.793	4.167**
CEO_Duality	–2.517	5.259**	–1.985	2.937*	–2.161	4.297*	–1.861	3.432*	-	-
LEV	0.072	0.084	0.021	0.008	0.136	0.353	0.126	0.494	0.046	0.039
IApresence	–3.625	2.707*	-	-	–3.507	2.685*	–3.516	2.698*	–3.645	2.752*
IA_OUT	-	-	-	-	-	-	-	-	-	-
FIRM_SIZE_2	-	-	-	-	-	-	-	-	-	-
Constant	–3.754	1.861	–5.097	2.673	–1.557	0.314	1.305	0.444	–5.777	3.231
χ^2	22.013 (p<0.05)**		23.399 (p<0.05)**		22.392 (p<0.05)**		20.709 (p<0.05)**		22.325 (p<0.05)**	
Classification accuracy	80%		84.4%		80%		75.6%		77.8%	
Pseudo R^2	0.527		0.552		0.534		0.502		0.533	

(*Continued*)

Appendix B. (Continued)

Variable	Regression 16 (without *LEV*)		Regression 17 (with *IA_OUT*)		Regression 18 (with assets as firm size mesure - *FIRM_SIZE_2*)	
	B	Wald	B	Wald	B	Wald
FRL	–1.524	1.500	–1.780	1.612	–0.996	0.904
FREQ	0.749	0.305	0.808	0.309	0.234	0.045
IA_SIZE	5.681	7.912***	6.479	6.931***	2.907	4.801**
EXP	–1.465	1.531	–1.654	1.415	–0.698	0.541
ACADEMIC	0.644	0.417	0.701	0.467	0.782	0.633
TRAINING_HRS	0.046	3.955*	0.038	2.769*	0.040	3.475*
CERT_Ratio	0.916	0.482	0.999	0.446	0.218	0.042
SCOPE	2.157	3.774*	3.077	4.100**	1.635	2.779*
FIRM_SIZE	0.935	4.894**	1.087	4.264**	-	-
CEO_Duality	–2.257	3.670*	–2.896	4.089**	–1.869	3.456*
LEV	-	-	0.074	0.056	0.125	0.477
IApresence	–3.681	2.782*	–3.921	2.789*	–3.573	2.673*
IA_OUT	-	-	2.593	1.540	-	-
FIRM_SIZE_2	-	-	-	-	0.043	0.017
Constant	–4.406	1.904	–5.347	2.162	0.532	0.007
χ^2	26.649 (p<0.01)***		28.748 (p<0.01)***		20.726 (p<0.1)*	
Classification accuracy	86.7%		84.4%		75.6%	
Nagelkerke (pseudo) R^2	0.584		0.663		0.503	

(*Continued*)

Appendix B. (Continued)

Note: ***, **, * indicate statistical significance at the *p*-value ≤ 0.01, 0.05 and 0.10 levels respectively; Panel A: Removal of correlated variables: Regression 1,2,3,4,5; Removal of control variables: Regression 5,6,7,8; Addition of *IA* outsourcing: Regression 9; Replacement of *FIRM_SIZE* with *FIRM_SIZE_2*: Regression 10; Variable definitions: *IAFQ*: *IAF* quality, *BoD_SIZE*: number of *BoD* members, *BoD_INDEP*: ratio of independent board members, *BoD_CHAIR*: *BoD* chairman independence, *AC_INDEP*: independent members of the audit committee, *ACknowledge*: audit committee accounting and auditing knowledge, *ACmeetings*: number of Audit Committee meetings on a yearly basis, *IApresence*: *IA* participation in audit committee meetings, *OUT_FUNDS*: foreign investment funds, *FIRM_SIZE*: natural logarithm of the number of employees, *BIG*4: the company's external auditor is one of the Big 4 audit firms, *REC_INV*: ratio of accounts receivable and inventory to total assets, *LEV*: ratio of total liabilities to equity; *IA_OUT*: internal audit outsourcing; *FIRM_SIZE_2*: natural logarithm of company's total assets; Panel B: Removal of correlated variables: Regression 11,12; Removal of control variables: Regression 12,13,14,15,16; Addition of *IA* outsourcing: Regression 17; Replacement of *FIRM_SIZE* with *FIRM_SIZE_2*: Regression 18; Variable definitions: *IA_CG*: *IA*'s active role in *CG*, *FRL*: level to which *IAF* reports, *FREQ*: frequency of management's response to *IA*'s findings, *IA_SIZE*: size of the *IAF*, *EXP*: internal auditors' experience, *ACADEMIC*: internal auditors' academic education, *TRAINING_HRS*: internal auditors' training, *CERT_Ratio*: internal auditors' professional certifications, *SCOPE*: range of a company's activities, *FIRM_SIZE*: natural logarithm of the number of the company's employees, *CEO_Duality*: *CEO* and chairman of the *BoD* are the same person, *LEV*: ratio of total liabilities to equity. *IApresence*: *IA* participation in audit committee meetings; *IA_OUT*: internal audit outsourcing; *FIRM_SIZE_2*: natural logarithm of company's total assets.

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